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# CHILD DEVELOPMENT



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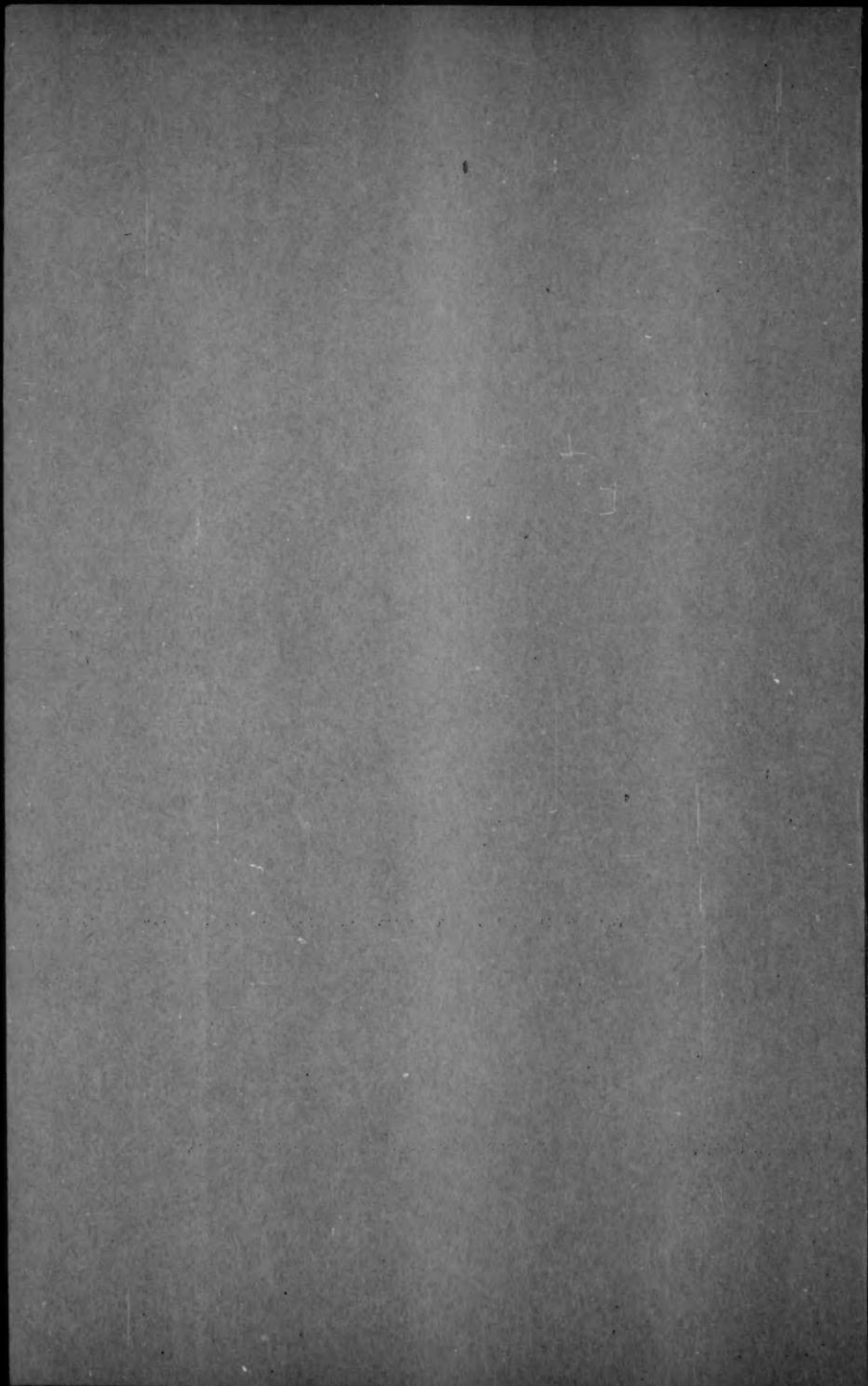
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# CHILD DEVELOPMENT

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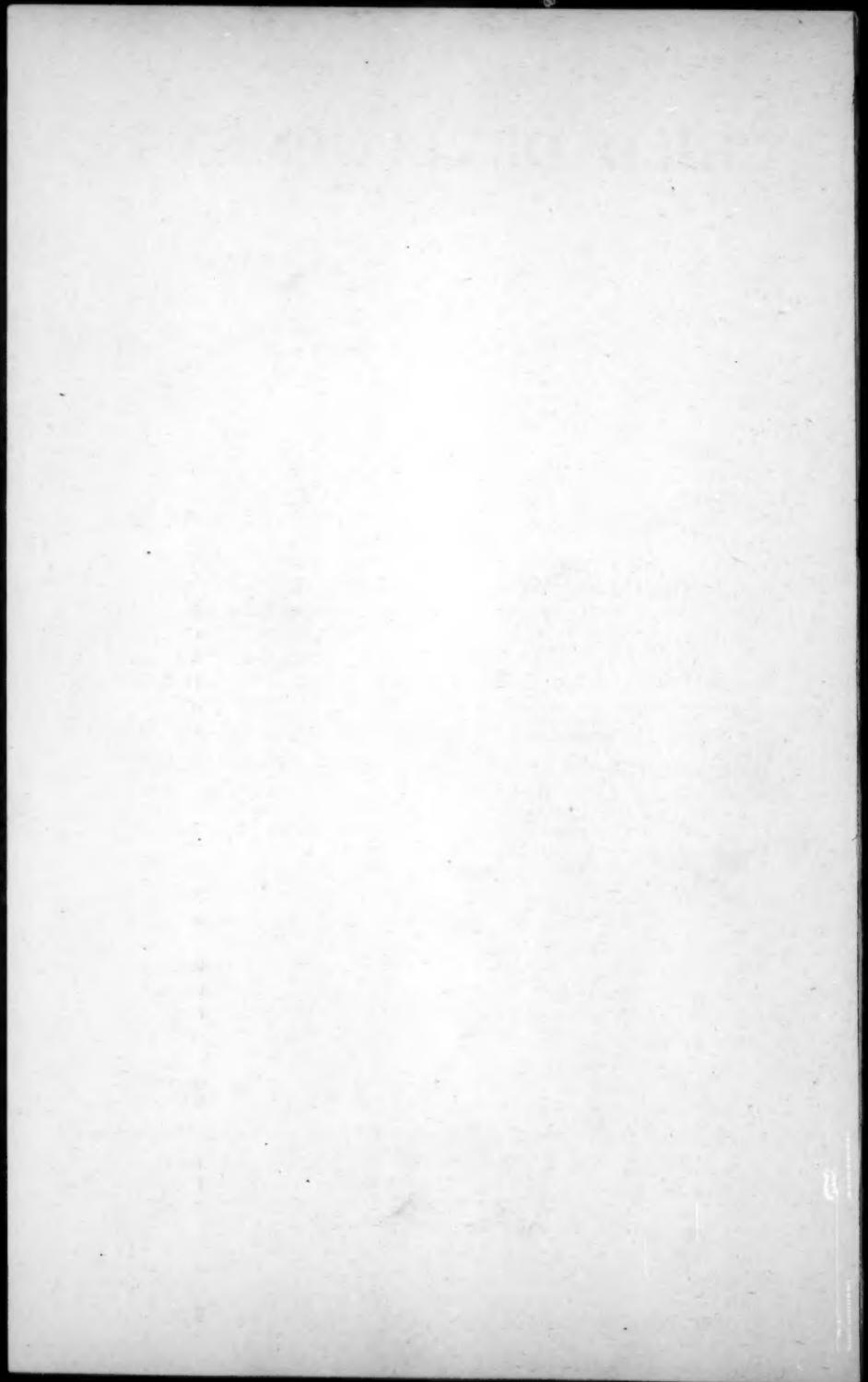
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DOLL PLAY AS A FUNCTION OF THE REALISM  
OF THE MATERIALS AND THE LENGTH OF  
THE EXPERIMENTAL SESSION<sup>1</sup>

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Projective doll play has become a widely used clinical procedure for the analysis of children's motivational systems. The fertility and complexity of data secured from it, however, have led its users to devote more consideration to problems of interpretation than to methodology. As a result, many variants of the basic technique have been reported, but no systematic investigation has been made of their effects on performance. If doll play is to become a fruitful, objective method for motivational analysis, detailed study must be made of the influence of important elements in the method itself.

The present study was designed to discover the effects, on certain significant aspects of doll play performance, of varying two characteristics of the procedure: kind of materials used and duration of the play session.<sup>2</sup> Various opinions have been expressed concerning materials, but for the most part investigators' preferences appear to have been largely a function of theoretical predisposition rather than objective information concerning the influence of different kinds of materials.

Method

**Experimental Variables**

The experimental design of the study required variation of materials and duration while other aspects of the procedure were held constant. Two kinds of material and two durations of the play session were used.

The materials differed with respect to their realism; for purposes of exposition they may be called low and high in degree. The high realism materials were a set of miniature real-life house furnishings and five clothed dolls. The low realism

<sup>1</sup>This is the second in a series of studies of projective doll play performed at the Iowa Child Welfare Research Station under the direction of Dr. Robert R. Sears.

<sup>2</sup>In a companion study, Pintler (7) has held these two factors constant and has varied two others: amount of experimenter-child interaction and degree of organization of presented play materials.

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materials consisted of a set of ambiguous, block-like toy furniture constructed crudely to represent common chairs, tables, beds, etc. The dolls were sexless, undressed, stuffed bodies with arms, legs and head.

The two durations used were 20 minutes and one hour. The 20-minute duration was presented three times in order that both groups would have equivalent total amount of doll play. The three sessions occurred within one week but not on any consecutive days.

The materials and durations were so distributed among 40 subjects that half received one kind of materials and half the other, while half the children of each of these subgroups had a single long session and half had three short ones. These combinations produced the following subgroups of 10 subjects each:

- Low realism material: long session
- Low realism material: short session
- High realism material: long session
- High realism material: short session

Hereafter, the term "experimental variable" will refer to the materials or durations while "experimental condition" will refer to one of the above four combinations of variables.

### Subjects

Forty children from the Preschool Laboratories of the Iowa Child Welfare Research Station were used as subjects. Four matched groups were constructed on the basis of sex and chronological age. There were five boys and five girls in each group and the age range for the total was from 3-0 to 5-6. The mean chronological age for each group was 48.4 months or approximately four years. The boys averaged consistently younger than the girls, ranging from 3-9 to 3-11, while the means of the girls ranged from 4-1 to 4-3. On the average, each set of four matched subjects (one of which was assigned to each of the experimental groups) had a four months age range; the minimum range was one month, the maximum, five months.

Nine of the children had previous experience with projective play (four 16 minute sessions) in a miniature preschool (1), and were divided 1, 2, 2 and 4 among the four subgroups. The minimum time elapsed since any child's last experience with projective play was four months.

The subjects were all very familiar with the investigator; she had taught many of them in the preschool and had had frequent contact with the others.

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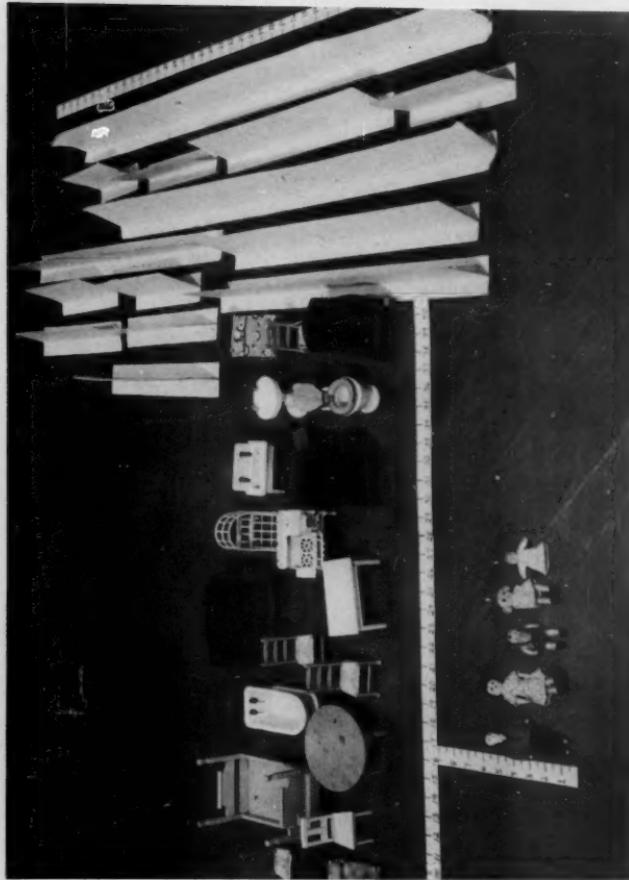


Figure 1. High Realism materials.

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### Equipment

High Realism Toys. The materials consisted of a living room set, dining room set, bathroom equipment, stove, sink, and three beds and a crib (see Figure 1). The largest piece, a bed, was approximately eight inches long and four and one-half inches wide, while the seat of the smallest chair was approximately three and one-half inches square, standing one and one-fourth inches from the ground. The dolls were made of wrapped string on a pipe-cleaner base, with woolen hair and kidskin feet. The clothing was cotton for all but the father, whose coat and trousers were felt. The adult dolls were five and one-half inches long, the children three and one-half inches and the baby two inches. All dolls were sufficiently flexible so that they could be placed in a sitting position. Only the baby could stand alone; its nightgown provided broader support than the feet alone on the other dolls.

In order to reduce exploratory behavior by the subjects, the number of manipulative parts on the toys was kept to a minimum. The toilet seat and cover could be lifted, but the oven door was glued shut, all faucets were immovable, and the drawers had been removed from the tables.

The white heavy cardboard uprights (or walls) were placed in a random order to the right of the toys. Subjects were not told how to use them. Each upright was three and one-half inches high and the lengths varied from four to 32 inches.

Low Realism Toys. There was a low realism toy (low fantasy support) corresponding to each of the high realism pieces, although its function was not readily recognizable by the children (see Figure 2). These toys were made of hard, white pine covered with yellow shellac. The sink, bathtub, and toilet had only pen lines to designate the hollow areas. The head and foot boards of the beds were equal in size, and the horizontal portion stood midway between top and bottom of the end pieces. The resemblance to bridges was generally noted by the children. The same white cardboard uprights, or walls, were used.

The dolls were cotton-stuffed plain cambric. Two adults, one blue and one tan, were five and one-half inches long; two children, both tan, were three and one-half inches, and a tan baby was two inches. No dolls were dressed. The hip and arm joints were very loose, allowing for sitting. The legs and arms of the larger dolls were separate and firmly crocheted to the bodies.

The toys for both sets were laid out as illustrated, spreading over approximately 38 inches. The uprights were immediately adjacent. The room was illuminated by a strong overhead light

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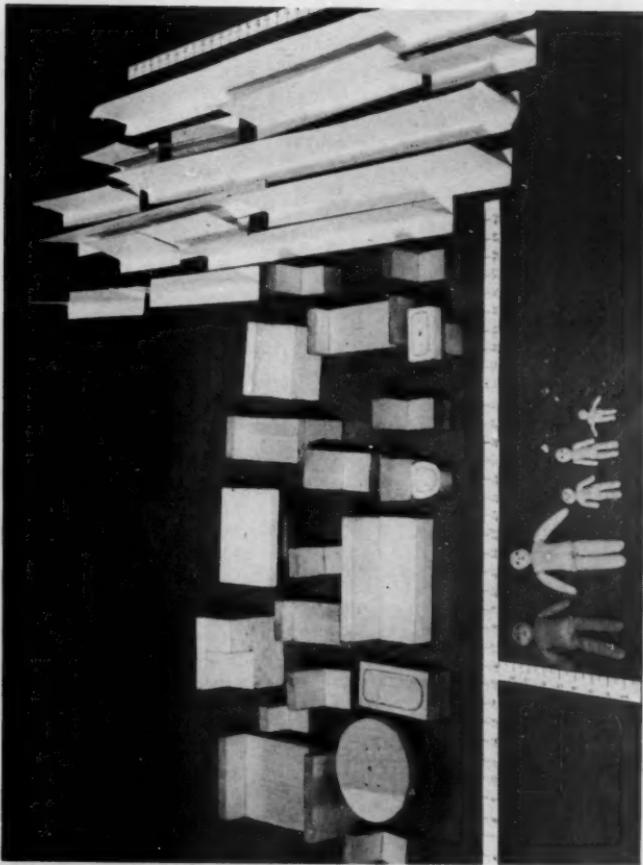


Figure 2. Low realism materials.

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plus several large, low windows.

### Procedure

The child was brought from the preschool to the experimental room and was shown the toys. These were placed in a random arrangement on the floor; the dolls were lined up in front and the boards on the right-hand side. This corresponds to the unorganized condition described by Pintler (?). The child was told, "Here are some toys for you to play with. You may play with them any way that you would like." The experimenter then sat on the floor fairly near the child, and while recording the play activity she maintained a friendly, interacting and interested relationship with the child the entire time. There were between 15 and 20 verbal exchanges with the subject every five minutes. This corresponds to Pintler's high experimenter-child interaction.

A sound-clock, located in an adjoining room, buzzed for approximately one second every 15 seconds. The experimenter recorded the behavior of the subject for the preceding interval as soon as the clock sounded. The judgments were made, for the most part, as the behavior occurred but were not recorded until the clock was heard.

### Scoring

Without more specific information than is presently available in the clinical literature it is impossible to decide what details of doll play will prove most important for diagnosis of children's motivational systems. Some aspects that give promise of being significant are: the total amount of aggression displayed, the amount of unique or individualized doll play as contrasted with stereotyped, routine play, and the relative amount of behavior not incorporating the experimental materials, the amount of manipulation which is more or less random or nonthematic, the amount of play which portrays a story but omits the dolls, and the relative number of different themes portrayed.

The following categories were defined to provide a notational system with which doll play could be continuously recorded by the experimenter in 15-second segments. Whenever the child's behavior fell into a certain category for more than half of a 15-second interval, this category was recorded. This is important to note in instances where ongoing behavior is temporarily interrupted by another category of behavior. Decisions as to the extent of behavior within a 15-second interval were of necessity subjective. For the most part a decision could be

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readily made as to whether or not the behavior had taken place for more than half of the interval.

### O - Organizational

All purposeful or systematic arranging of the materials, either setting up, rearranging or disorganizing a previously organized pattern. Naming, counting or identifying dolls or other experimental equipment. Visually surveying the materials immediately following organizational or stereotyped thematic behavior.

If the child claims that there is an ongoing theme, e.g., family moving, but the behavior fits the definition of organizational, it is marked organizational.

Comments such as, "We have a table like this at home" are not considered tangential when concomitant with organization. If the entire 15-second interval is merely the child's comments regarding placement of materials, it is considered organizational.

### Ox - Organizational: nonstereotyped or inappropriate

Placing the materials in a way inappropriate to an ongoing theme or specified construction.

### E - Exploratory

Activity which is primarily familiarizing the subject with the equipment. Manipulation of toys such as picking up, fingering; visually surveying the materials prior to any organizational or thematic behavior at the onset of an experimental session, or immediately following tangentiality.

Comments such as "Does the door open?" "What is that?" which continue for a full 15-second interval.

### T - Tangential

All behavior not incorporating the experimental materials or not related to the experimental situation. Looking out of the window, asking the experimenter irrelevant questions, such as "Is it time to go now?" walking or gazing aimlessly around the room. Thematic elaboration interrupted for more than one-half of a 15-second interval by irrelevant comments such as, "My doll at home sits down."

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The child has set theme and withdraws from the situation explaining, "They're sleeping-dead" and refuses all stimulations to continue doll play.

### P - Tangential play

Random manipulation of the materials. Aimless piling, swinging or pounding of equipment. Tangential but utilizing the toys.

### Th - Thematic-stereotype, routine behavior

Doll action appropriate to the time, place, situation and characters involved.

### NStTh - Nonstereotype thematic-individualized<sup>3</sup>

Any doll action or verbalization indicating an element of inappropriateness to an ongoing theme. Distortion in the role of a character being portrayed.

Detailed criteria for judging appropriate and inappropriate actions are given by Phillips (6, pp. 13-14).

### STh - Self-thematic

The child uses himself as a character in thematic elaboration; he tries to fit into chairs, beds, etc. If complete identification with a doll is recognized this is not considered self-thematic. If inappropriateness is involved it is noted.

### NHTh - Nonhuman thematic

No dolls are involved in thematic elaboration. No characters or persons are portrayed, e.g., car going up a hill.

### Agg - aggression

Hostility as expressed by one doll to another as tone

<sup>3</sup>This category and aggression are to be thought of in a one-minute frame of reference. If the observer is unable to judge at once whether or not the ongoing behavior is nonstereotyped or aggressive, but reaches a decision within one minute, changes are made in the preceding notations.

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of voice in dialogue or action. Hostility of the subject towards the dolls or other experimental materials, as well as towards the experimenter. Aggression includes portraying a destructive scene, such as windstorm, doing a forbidden act such as painting the furniture, and the slamming together of materials while organizing or disorganizing.

When the child is tangential and kicks the wall or during tangential play when he pounds the toys together or twists the dolls, the child is thought to be acting aggressively.

Interpretations consonant with the definition of aggression by Dollard, Doob, Miller, Mowrer and Sears (3): "an act whose goal-response is injury to an organism (or organism-surrogate)."

### Theme change

Any change in locus of doll action as from home to school. Any purposeful shift in the meaning of the construction being completed, e.g., making a bus and change to a train.

Three types of notation were made: (a) Those symbols were assigned to each scoring interval which represented the major definitions, excluding aggression and instances of inappropriateness or nonstereotype. (b) In order that the total frequency of aggression or inappropriateness should be recorded, the notation of their occurrence was made below the behavior categories, regardless of the duration. Whether or not the child was aggressive for less than one-half of a 15-second interval, the occurrence of the behavior was noted. (c) A running score of the number of experimenter-child interactions was recorded; these were classified as either rapport or tangential stimulations according to the ongoing behavior of the subject at the time the stimulation was given (7). If the child was concerned with the toys, the stimulation was considered as rapport; if the child was tangential, the stimulation was thus classified.

A sample of the notational record is presented:

Three minutes											
				Car							
H				P	NTh	STh	NHTH				
E	E	O	O	Th	Th	T	T	x ag			
								ag			
Rapport #/#				Tangential //							

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### Reliability

Pintler and Phillips observed together in order to establish the reliability of the scoring method. One observed through a one-way screen while the other acted as experimenter. After preliminary practice with the recording procedure in each of the experimental conditions, the final reliability measures were computed from four hours of experimentation. Of the eight possible combinations of variables involved in the two experiments, the following were selected; each was used for one hour.

N	Duration	Realism	Organization	Exper. stim.
1	Long	Low	Unorganized	High
3	Short	High	Unorganized	High
2	Short	High	Organized	Low
2	Short	High	Organized	High

The statistical procedure for calculating observer reliability was that of percentage of agreement. The formula was:

$$\frac{2 \times \text{the number of agreements between observers A and B}}{\text{Total number of observations of A plus B}}$$

The criteria for agreement were as follows:

1. Aggressions: if both observers noted aggression within two 15-second intervals of each other.
2. Nonstereotyped thematic, or organizational behavior: if both observers noted these items within a range of two 15-second intervals.
3. Change of theme: if both observers recorded within a range of two adjacent intervals when a new theme was introduced.
4. All other categories: if both observers recorded the same symbol at the same time.

The relative leniency in scoring the first two items noted above was adopted because the measure sought was frequency of these types of behavior rather than the exact sequence of their occurrence. For the change of theme it was extremely difficult to determine the exact interval at which the new theme started unless the child was verbalizing at the moment.

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The criteria for disagreement were as follows:

1. Omission by one of the observers.
2. Failure to record the items of behavior within the limits of agreement designated above.

Table 1 presents the reliabilities for seven categories.

TABLE 1

FREQUENCY OF OCCURRENCE AND PER CENT AGREEMENT  
BETWEEN TWO OBSERVERS' RECORDINGS OF THE VARIOUS  
CATEGORIES DURING FOUR HOURS OF OBSERVATION

Category	Frequency	% Agreement
Exploratory	89	83
Organization	260	90
Thematic	849	96
Nonstereo. thematic	413	91
Tangential	386	97
Tangential play	17	59
Agression	264	83

### Results

#### Mean Frequencies of Behavior Under the Four Conditions

The group means for each of the combinations of experimental variables are shown in Table 2. In each case the number of subjects is ten - five boys and five girls.

Outstanding differences are noted in the amount of exploratory behavior between the two high realism conditions and the two low realism conditions, with predominantly more in the former conditions. On the other hand, there was decidedly more organizational behavior with the low fantasy materials. Tangential play was relatively more frequent in the long sessions of low realism than in any other.

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TABLE 2

MEAN FREQUENCIES OF BEHAVIOR UNDER EACH OF FOUR  
 COMBINATIONS OF EXPERIMENTAL VARIABLES  
 (N = 10)

Category of Behavior	High Real. Short Dur.	High Real. Long Dur.	Low Real. Short Dur.	Low Real. Long Dur.
Exploratory	50.1	34.9	13.4	9.6
Organizational	37.0	44.5	96.3	61.7
Inapprop. organiz.	8.3	7.2	4.8	3.5
Thematic, stereo.	54.9	52.5	49.8	51.4
Self-thematic	4.9	5.5	3.2	3.4
Nonhuman thematic	2.9	10.3	7.0	5.0
Nonstereo. thematic	32.6	24.1	17.5	18.9
Tangential	35.9	50.5	26.6	49.6
Tangential play	12.9	9.9	19.0	34.6
Tangential and tang. play	48.8	60.4	45.6	84.2
Aggression				
Total	40.9	31.0	24.8	39.4
Thematic*	33.7	23.0	16.1	17.9
Tangential	7.2	8.0	8.7	21.4
No. of themes	5.5	4.9	15.2	8.2
Aggression latency**	35.0	23.0	36.2	34.5

\*Aggression occurring during session other than during tangential or tangential play.

\*\*Mean was computed from the median score of each subject.

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### The Significance of the Differences Between the Means

In calculating the significance of the differences obtained between the means listed in Table 2, the "t" statistic method for matched groups was used (5). A distribution was made of the differences between scores of matched subjects, and the statistic "t" derived from this distribution to obtain the significance of the mean differences.

All the high realism subjects were compared with all the low realism; all the long, with all the short. Specifically, each high realism, long duration subject was compared with the matched subject in the low realism, long duration group, and similarly for the two short duration groups.

The results (Table 3) are expressed in terms of the significance of mean differences; 1 of c is the level of confidence. Minus signs indicate that the behavior category was less frequent for the first mentioned condition.

There are no significant differences between the short and long sessions in any category. In brief it may be seen that the amount of exploratory behavior, organizational behavior, tangential play and number of different themes portrayed vary significantly as a function of the realism of the toys.

### The Significance of the Differences Between the Means of the First and Third 20 Minutes of Each Variable for all Categories

In order to determine the difference in the performance of the subjects in the first and last 20 minutes of a long session and the first and third independent short sessions, the same "t" test was used. The raw scores obtained for one individual for the first session were compared with the scores for the same individual on the third session (or third 20-minute period of the hour session). This was done for all four variables. The results are given in Table 4. The minus sign signifies a smaller frequency of the behavior in the initial 20-minute period.

There was a definite drop in amount of exploratory play, and some decrease in amount of organizational behavior. Aggression increased in every case, although less significantly than did tangential behavior. The rate of increase in tangential play was inconsistent for the four variables.

The mean rate of change from first to third sessions or sections for tangential behavior and exploratory behavior are represented graphically in Figures 3 and 4.

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TABLE 3

**SIGNIFICANCE OF THE DIFFERENCES IN FREQUENCY OF BEHAVIOR UNDER TWO EXPERIMENTAL CONDITIONS (N = 20 FOR EACH CONDITION)**

Category	High vs. Low Realism		Long vs. Short Duration	
	Mean Diff.	1 of c	Mean Diff.	1 of c
Exploratory	31.0*	< 1	-9.5	< 10
Organizational	-39.6	< 1	-13.6	< 20
Inapprop. organiz.	3.6	20	-1.2	70
Thematic, stereo.	3.2	80	-.4	--
Self-thematic	1.9	20	.4	90
Nonhuman thematic	.6	90	-2.7	60
Nonstereo. thematic	10.2	20	-3.6	60
Tangential	5.2	70	18.6	20
Tangential play	-15.4	5	6.4	40
Tang. and tang. play	-11.3	30	25.1	10
Aggression				
Total	3.0	80	2.2	90
Thematic	11.4	10	-4.4	60
Tangential	-7.4	20	6.8	30
Theme changes	-6.4	2	-3.8	20

\*Positive values indicate greater frequency in the first mentioned condition.

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TABLE 4

SIGNIFICANCE OF THE DIFFERENCES IN FREQUENCY OF BEHAVIOR BETWEEN FIRST AND THIRD 20 MINUTES OF EXPERIMENTATION UNDER EACH VARIABLE  
(N = 20 FOR EACH CONDITION)

Category	Condition							
	High		Low		Long		Short	
	Mean Diff.*	1 of c		Mean Diff.*	1 of c		Mean Diff.*	1 of c
Exploratory	14.0	1	6.8	1	12.4	1	8.4	1
Organizational	6.8	6	3.4	40	8.0	10	2.7	40
Inapprop. organiz.	2.0	20	.1	--	2.6	5	-2.2	10
Thematic, stereo.	1.0	80	11.2	1	12.9	1	8.2	2
Self-thematic	.6	--	0	--	2.0	30	-1.4	10
Nonhuman thematic	-3.2	30	-1.6	30	-3.4	20	-1.4	40
Nonstereo. thematic	-3.9	20	.1	--	-2.9	30	-1.2	60
Tangential	-18.8	1	-14.2	2	-24.5	1	-9.0	5
Tangential play	-5.4	1	-5.1	30	-6.3	10	-4.2	20
Tang. and tang. play	-24.8	1	-19.2	1	-30.8	1	-13.2	1
<b>Aggression</b>								
Total	-11.2	1	-6.8	5	-9.5	1	-8.4	5
Thematic	-6.2	5	-3.4	5	-5.0	5	-4.6	10
Tangential	-5.0	5	-3.3	20	-4.4	20	-3.8	20
Theme changes	.6	20	.1	--	.8	10	-.4	5

\*Positive values indicate greater frequency in initial 20-minute period.

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### Discussion

#### Exploratory Play

There was significantly more exploratory behavior with the high realism than with the low realism materials. This is readily understandable when one contrasts the amount of detail on the two types of furniture. Most of the exploratory behavior with the high realism materials was centered on the toilet and the stove, the former because the seat and lid would lift and the latter because the oven door should, but would not, open. The faucets on the sink, bathtub and washbowl also commanded attention.

If exploratory behavior is to be minimized in a doll play situation, the less realistic toys are better than the others. Although the subjects asked questions about the function of various pieces of this set of materials, there was little fingering or manipulation of parts.

For all the variables there was a significant decrease in amount of exploratory behavior from the first to the third sessions, or portions of the long session. Comparison of the third sessions with the high and low realism materials shows a difference significant below the 1 per cent level, the greater frequency being with the high realism toys.

The increase in amount of exploratory behavior with the high realism materials from the second to the third 20 minutes (Figure 3) implies that exploratory behavior may be closely analogous to tangential play after the initial familiarization with the toys in the first session. The child may be merely "wasting time" fingering the toys; the behavior was frequently followed by tangential play or tangential behavior.

#### Organizational Behavior

In contrast to the exploratory behavior, this category occurred more frequently with the less realistic materials than with the more realistic. Because of the ambiguity of the pieces there was relatively more leeway with respect to kinds of themes with which the child appeared to feel free to build. The scoring system was inadequate in that if the child was exploring in order to see how the low realism materials fit together, but was doing it systematically, his behavior was recorded as organizational. This "fitting together" almost invariably led to a systematic construction (2). However, when a subject made a pile of the block-like toys, this was recorded as unspecified organizational behavior (no theme recognized), whereas similar

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behavior with the more realistic toys was classified as tangential play.

There was no consistent change in amount of organizational behavior between the first and third sessions under any variable or condition.

Figure 3

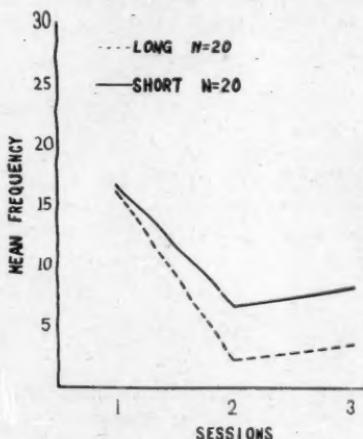


Figure 4

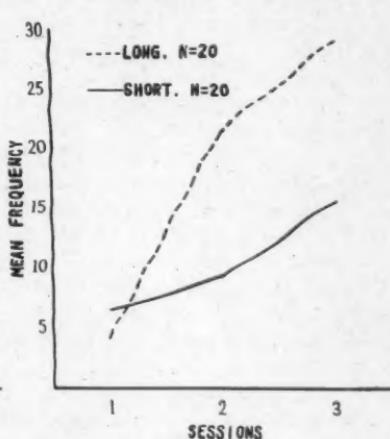


Figure 3. Mean frequency of exploratory behavior with the long and short duration variables.

Figure 4. Mean frequency of tangential behavior with the long and short duration variables.

#### Inappropriate or Individual Organizational Behavior

There was a greater amount of inappropriateness in the constructions made with the high realism toys than with the low, but the difference was not significant. The high stimulus relationship with the child was so defined as not to permit questions involving interpretation. Therefore, elements of inappropriateness with the low realism toys were difficult to judge unless specified by the child. With the high realism materials, on the other hand, a house built with the stove placed in the bathtub could be readily recognized as an instance of inappropriateness.

The duration factor did not influence the relative amount of this behavior.

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### Stereotyped Thematic Play

The experimental variables did not affect the amount of thematic behavior. In all conditions there was a decrease from the first to the third 20 minutes; this was doubtless a corollary of the increase in tangentiality.

Although there was slightly more stereotyped thematic play in the first 20 minutes of the long sessions than of the short, the mean amount was less for the remaining two-thirds of the time.

### Self-thematic and Nonhuman Thematic Play

Both types of behavior were infrequent, and there were no significant differences as a function of the experimental variables. There was a consistent increase in amount of nonhuman thematic play from the first to the third 20 minutes under all conditions, but none of the differences was statistically significant.

### Nonstereotyped Thematic Play

Since this may be one of the more important categories from a clinical standpoint, it is worth noting that its frequency did not vary significantly as a function of the variables tested. There was slightly more of this category with the high realism toys than with the low ones. The clinician may expect in an hour-session about the same amount of nonstereotyped doll play as in three 20-minute periods. Bach (1) found a sex difference with respect to the amount of individualized fantasy portrayed, the boys showing the greater amount, and a similar trend was noted in the present data. An analysis of sex differences will be presented in another paper (8). The amount of nonstereotyped doll play maybe said to be a function of individual differences and other experimental conditions rather than of either of the two factors varied systematically in this investigation.

With the low realism materials there was a difficulty in recording somewhat analogous to that with the nonstereotyped organizational behavior category. Since the ongoing theme often utilized a crude construction, the detail necessary for denoting inappropriateness was missing. Furthermore, the block-like materials did not lend themselves to certain kinds of inappropriate uses as readily as did the more realistic ones. For example, children would stuff the mother doll into the opening under the oven. The low realism toys had no such openings.

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On the other hand, the block-like toys would suggest inappropriate aspects of construction once they were assembled. Characteristically, a chair placed face down suggested a gun numerous times; a gun on a church was considered inappropriate.

There was a slight tendency for the amount of nonstereotyped fantasy to increase from the first to the third sessions.

### Tangential Behavior

There was not a significant difference in the amount of tangentiality as a function of the experimental conditions. When the variables were considered independently there was a significant increase from the first to the third of the 20-minute sessions, for all except the short sessions. The mean difference for the long sessions was 2.6 times greater than the mean difference for the short sessions. The difference in the rate of increase in tangential behavior, between the long and short sessions, as measured by the difference between third session (or 20 minutes) scores, was significant below the 5 per cent level of confidence, the rate of increase being greater for the long than for the short (Figure 4).

This may have been due in part to the fact that once a child had had the initial short session, he knew that after a certain length of time he would return to the preschool. On the other hand, a child in the long period had no conception whatever of the total time he would be expected to stay in the room. In the first case, when the child became tangential, he knew that soon afterwards the period would end; therefore, he was more willing to return to the materials than was the child in the longer session. In the latter case, it was sometimes impossible to get the child to return to the equipment after a tangential episode. Two of the younger boys cried for the last 20 minutes.

### Tangential Play

There was not a significant difference between the high and low realism or the two duration conditions.

As with tangential behavior, tangential play increased from the first to the third sessions.

### Tangential Behavior and Tangential Play Combined

The same trends that were found for tangential behavior alone are paralleled here. The levels of confidence are better than 1 per cent for all the variables in the comparisons between

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the first and third sessions.

### Aggression: Thematic and Tangential

Aggression did not vary significantly in amount as a function of the experimental conditions used in this investigation. The total amount of aggression was slightly less for the short sessions with low realism, but the largest mean was for short session with high realism materials.

There was more aggression shown in the third than in the first 20 minutes for all variables. Most of the aggression was in connection with thematic play rather than with tangentiality.

The mean latency of aggression, computed from the median times of appearance for each subject under each condition ( $N = 10$ ), was found for all four groups. The onset was earliest for high realism, long duration and latest for the low realism, short duration.

### Number of Theme Changes

With the low realism toys there were significantly more theme changes made than with the high realism materials. There were nearly twice as many themes in the short sessions with these latter toys as in the comparable long ones.

The contrast between the two types of materials would probably not have been as great were it not for the scoring procedure. On the premise that the subject, when organizing, was constructing a background for a forthcoming story, all specified and unspecified organizational behavior was given theme credit. Even if the theme did not take place, the unspecified constructions remained in the theme category. Therefore, with the greater amount of organizing with the low realism materials, the greater number of themes was to be expected.

In spite of the broad definition of thematic change, there was nevertheless considerable variation in the kinds of stories played out with both sets of toys. For example, cars, boats, airplanes, churches, and so forth were constructed and played out with both. There was a greater variety, however, with the less realistic materials. It was clear that house furnishings did not have a "single, exclusive use" as Weiss-Frankl (10) asserts, and if the house furniture is considered a "limited assortment" in terms of Tallman and Goldensohn's (9) usage, it is still ample for the expression of aggression in many non-stereotyped ways.

The number of theme changes did not vary significantly from the first to the third sessions under any conditions or as a

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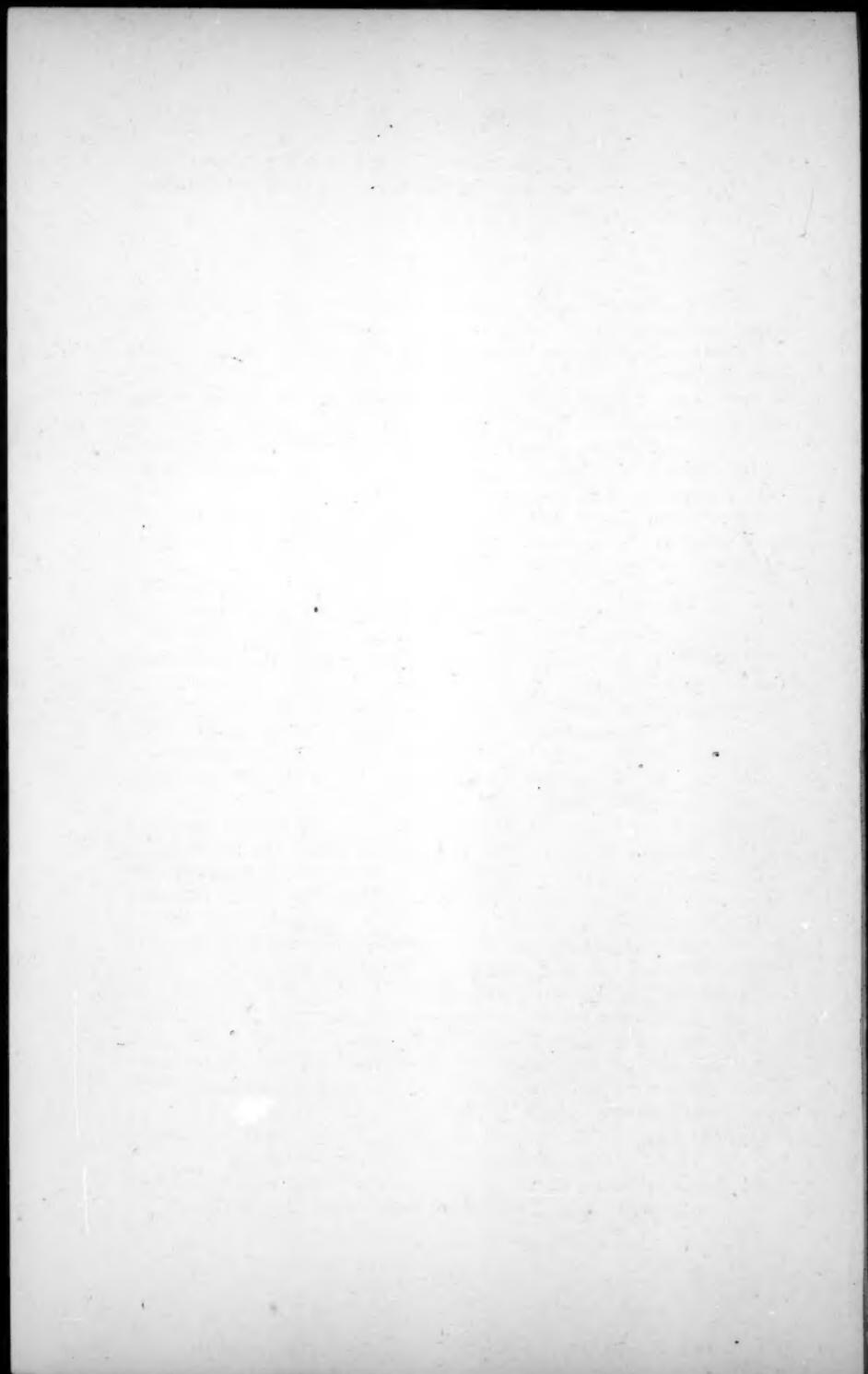
function of any of the variables. It is to be noted, similarly, that organizational behavior did not vary significantly in amount in this same analysis.

### Conclusions

1. There was relatively more exploratory and less organizational behavior with the high realism materials.
2. The opposite relation obtained with the low realism materials.
3. Other categories appeared not to be influenced by the two variables under consideration.
4. There was a significant decrease both in exploratory behavior and in stereotyped thematic play from first to third session (or 20-minute period).
5. There was a significant increase in both aggression and tangentiality from the first to third session (or 20-minute period).

### REFERENCES

- (1) Bach, G. R. Young children's play phantasies. *Psychol. Monog.*, 1945, No. 272. Pp. 69.
- (2) Bender, L., and Schilder, P. Form as a principle in the play of children. *J. Genet. Psychol.*, 1936, 49, 254-261.
- (3) Dollard, J., Doob, L., Miller, N., Mowrer, O., and Sears, R. R. *Frustration and aggression*. New Haven, Yale University Press, 1939. Pp. 209.
- (4) Durfee, M. B. Use of ordinary office equipment in "play therapy." *Am. J. Orthopsychiat.*, 1943, 12, 495-508.
- (5) Lindquist, E. F. Statistical analysis in educational research. New York, Houghton Mifflin Co., 1940. Pp. 266.
- (6) Phillips, R. Doll play as a function of the realism of the materials and the length of the experimental session. Thesis. State University of Iowa, 1944. Pp. 45.
- (7) Pintler, M. H. Doll play as a function of experimenter-child interaction and initial organization of materials. *Child Develop.*, 1945, 16, 145-166.
- (8) Pintler, M. H., Phillips, R., and Sears, R. R. Sex differences in the projective doll play of preschool children. *J. Psychol.*, 1945. [In press.]
- (9) Tallman, F. F., and Goldensohn, L. N. Play technique. *Am. J. Orthopsychiat.*, 1941, 11, 551-561.
- (10) Weiss-Frankl, A. B. Play interview with nursery school children. *Am. J. Orthopsychiat.*, 1941, 11, 33-39.



DOLL PLAY AS A FUNCTION OF EXPERIMENTER-CHILD  
INTERACTION AND INITIAL ORGANIZATION  
OF MATERIALS<sup>1</sup>

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Most of the literature on the uses of doll play as a projective technique during the past ten years consists of case records of its use with individual children. Its usefulness has been demonstrated most frequently in revealing the area in which the child's main problems lie, in developing a satisfactory working relationship between therapist and child, and in providing for the release of aggressions and the abreaction of anxiety. Recently the technique has been used experimentally in an attempt to modify the personality traits of normal children (2) and to investigate fantasy systematically (1).

Because of the variety of purposes for which play therapy has been used, no single criterion of "good" play has been evolved. The type of activity which the diagnostician or therapist wishes to elicit from the child is dependent upon the purpose for which the play is being used. The way in which the materials are presented and the relationship between therapist and child are dependent also upon the purpose for which the play is instituted. The literature reveals tremendous differences in the way in which the technique is applied. One worker presents the materials organized to represent a specific problem which the child is known to have. Another presents materials in an unorganized fashion and feels that the child's organization of the materials is in itself revealing. The psychoanalysts interpret the child's play to him; many therapists outside the realm of psychoanalysis take an active role in the play situation; and others remain as detached as possible from the situation.

It seems reasonable to suppose that the type of play which one gets from the child is dependent to some degree upon the way in which the materials are presented and the degree to which the therapist interacts with the child. Up to the present, no experimental investigations have been made to reveal the relationship between such variables and the type of play which is elicited.

<sup>1</sup>This is the third in a series of studies of projective doll play performed at the Iowa Child Welfare Research Station under the direction of Dr. Robert R. Sears.

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The aims of the present study are:

1. To evolve an objective quantitative system of scoring which will have a known reliability and will utilize categories for the analysis of play content which are meaningful in terms of the various uses which are made of the technique.
2. To isolate and control the variable of experimenter interaction with the child and to discover the effect of varying the amount of such interaction.
3. To discover the effect of presenting the play materials in an organized or unorganized fashion.

Forty preschool children took part in three 20-minute play sessions each. With half the group, a low level of experimenter interaction with the child was maintained. With the other half, the interaction was at a much higher level. Twenty of the children received the materials organized in the form of a conventional house. For the others, the materials were unorganized. Quantitative analysis of the records revealed the effect on play of the above variations of technique.

### Experimental Variables

#### Experimenter Interaction with the Child

In the doll play situation, the possible experimenter interactions with the child may be analyzed into the following categories:

1. Rapport establishing and maintaining: This refers to any activities, on the part of the experimenter, designed to make the child feel at ease in the experimental situation and to orient him to the task at hand. It includes answering the child's questions about the experimental materials, showing interest in the child's activities with the dolls and materials, maintaining a certain amount of physical distance between experimenter and child, and reassuring the child when he shows anxiety.
2. Stimulation to stay in the experimental situation: This refers to any attempts by the experimenter to keep the child's interests and activity centered on the experimental materials.
3. Generalized stimulation toward thematic elaboration: This refers to all efforts by the experimenter to get the child to continue with a theme he has already started or to go on to a new one - but not stimulation toward any specific theme content.
4. Specific stimulation of child to extend theme or to initiate a particular theme: This refers to the experimenter's attempt to get the child to elaborate and extend a theme which he has already been carrying on. For example, when the subject has made the little girl doll hit the father, the experimenter might

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say, "Oh, she hit the daddy - what will he do to her now?" This is considered as a specific attempt to extend the theme. The experimenter might attempt to introduce a particular action by such a question as "Does the daddy spank the little girl?"

5. Experimenter asks child for interpretation of the story: Such remarks as "Why did the boy do that?" "Does she like to be a little girl?" etc., are illustrative of this type of stimulation.

6. Experimenter interprets the child's play: This type of stimulation is designed to give the child insight into the meaning of the play sequences which he is producing and to reveal to the child his underlying motivational systems.

In attempting to control the variable of experimenter interaction with the child, it was not feasible to work out precise questions to be used with every child at definite time intervals. Instead, two levels of experimenter interaction with the child were defined which represented very different degrees of interaction. Only the first three of the categories given above were utilized, and a range of frequency for interaction was maintained. The following description illustrates what is meant by low and high levels of experimenter interaction with the child as they were used in this study.

### Low Level of Experimenter Interaction with the Child

This situation was characterized by the minimum amount of experimenter interaction with the child consistent with having the child made aware of the test materials, and enough at ease so that he would feel free to manipulate them as he pleased. The child felt that the experimenter was engrossed in her own work, and only incidentally aware of what he was doing. The situation was handled in the following way, after the preliminary standardized directions were given to the child.

#### 1. Rapport establishing and maintaining

a. Experimenter went to her seat at a table a few feet from the child and devoted herself to her records.

b. Child's questions about materials were answered briefly and factually - with the experimenter returning at once to her records.

c. The only encouragement given to the child was in the form of an occasional smile if the child looked up and seemed to expect some response or if he seemed anxious. If he asked, "Is that all right?" after he had done something, the experimenter answered, "Yes, of

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course, you may do anything you want."

### 2. Stimulation to stay in the experimental situation, i.e., control of tangentiality

a. In general, the experimenter ignored the child's tangential remarks and tangential behavior. If necessary, his tangential questions were answered very briefly and in a noncommittal way.

b. No attempt was made to keep the child's attention directed to the experimental materials.

c. If the child tried to leave the room the experimenter said, "It isn't time to go yet. You stay in the room. As soon as it's time to go back and I've finished my work, I'll take you. You may play here any way that you like." The only limit placed on the child's tangentiality was the boundary of the experimental room.

### 3. Quantitative limits of interaction

a. The experimenter used not more than a total of five such interactions during any five-minute period.

## High Level of Experimenter Interaction with the Child

This situation was characterized by considerable interaction between the child and the experimenter. The child was made to feel that the experimenter was an interested onlooker of his activity - that what he was doing was of interest to her - and that she was aware of all his behavior. The situation was handled in the following way after the preliminary standardized instructions were given.

### 1. Rapport establishing and maintaining

a. The experimenter sat on the floor beside the child - looked at the toys - scored unobtrusively.

b. The child's questions were still answered briefly and factually (i.e., questions about the materials) but the experimenter continued to devote her attention to the child and the materials, thereby giving the child the feeling that he was expected to play with the materials in some way.

c. The experimenter showed her interest by smiling, laughing with the child, nodding her head approvingly when he had carried through some play sequence with the materials.

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d. Since in the high level of experimenter interaction with the child, the child was aware that the experimenter was interested in and cognizant of all his play activity, it was necessary for her to react to and reassure the child when he showed evidence of anxiety feelings. The child's anxiety was often aroused when he had had the dolls perform some unconventional or generally-forbidden act, or when he had carried through a particularly aggressive sequence. His anxiety could be recognized by such behavioral symptoms as anxious looks at the experimenter, sudden cessation of a sequence of doll play which he had started, or sudden requests by the child to return to preschool. The experimenter handled such situations by maintaining at all times a matter-of-fact attitude, regardless of what the child did. She smiled reassuringly if the child looked anxious, or laughed with the child if he seemed to be resorting to this type of behavior to cover up his anxiety. If the child asked, "Is that all right?" after having done anything, the experimenter answered, "Yes, of course, you may do anything you want."

### 2. Stimulation to stay in the experimental situation, i.e., the control of tangentiality

Every effort was made to keep the child's attention centered on the experimental situation. In other words, there was an attempt to establish a boundary around the experimental situation itself - not extending it to include the whole room as was done in the low level situation. The best method to use in reducing the amount of tangential behavior depended upon the particular child. At no time did the experimenter's efforts in this line go so far as to create a frustration situation for the child. The following concrete methods were used:

- a. Ignored the child's tangential remarks or behavior.
- b. Indirectly attempted to draw the child back to the experimental situation by asking, "What are the dolls going to do next?"
- c. Participated with the child in the tangentiality to the degree of answering his questions briefly, looking at something he pointed out, or leaving the immediate area of the experimental situation to follow him. After the brief participation, the experimenter attempted to get the child back to the experimental equipment by returning herself.
- d. Attempted to satiate the child's interest in anything

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outside the experimental situation by a dull and boring explanation of it.

e. Expressed firmly the desirability of the child's returning to the experimental situation.

### 3. Generalized stimulation toward thematic elaboration

a. The experimenter described objectively an action sequence which was taking place in a tone of voice which suggested further elaboration. For example, "Oh, the little girl is setting the table . . ."

b. Repeated in an encouraging tone of voice anything the child had just said.

c. Facilitated the child's production of a sequence by carrying out the child's suggestion that the experimenter place a doll in a specific chair, etc.

d. Made facilitating remarks such as, "Oh, yes, I see. And what happens next? What do they do now?"

### 4. Quantitative limits of interaction

a. The experimenter used a total of not less than 15 nor more than 20 such interactions during any five-minute period.

#### Organization of Materials

##### Unorganized Method of Presentation

The experimental materials were spread out on the floor in two irregular rows (see Figure 1). The items which are conventionally placed together in a room, such as a stove and refrigerator, were separated to prevent the suggestion of any definite arrangement to the child. The cardboard walls were placed to the right of the other materials and at right angles to the rows. The five dolls were placed in a row below the other materials in the following order from left to right: father, mother, girl, boy, and baby.

##### Organized Method of Presentation

The same experimental materials were now organized into a conventional house consisting of a living room, dining room, kitchen, two bedrooms, and a bath (see Figure 2). The movable cardboard strips formed the walls of the house and divided the space into rooms. The five dolls were placed in a row below

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and outside the house in the same order as before.

### Method

#### Subjects

Forty children from the Preschool Laboratories of the Iowa Child Welfare Research Station were used in this study, 20 of each sex. Children in this preschool are a somewhat selected group from homes of higher than average socio-economic status. They rank above average in intelligence. The age range was from 3-10 to 6-3. The subjects were divided into four experimental groups, each consisting of five boys and five girls. Subjects were matched on the basis of sex and chronological age. That is, a girl in Group I was matched with a girl of the same approximate chronological age in Groups II, III, and IV. The same procedure was followed for the boys.

The conditions under which each group of ten children was treated and the mean chronological ages of the subjects were as follows:

		Mean C.A.
Group I	Low interaction	Unorganized materials 4.97 years
Group II	Low interaction	Organized materials 4.86 years
Group III	High interaction	Unorganized materials 4.96 years
Group IV	High interaction	Organized materials 4.95 years

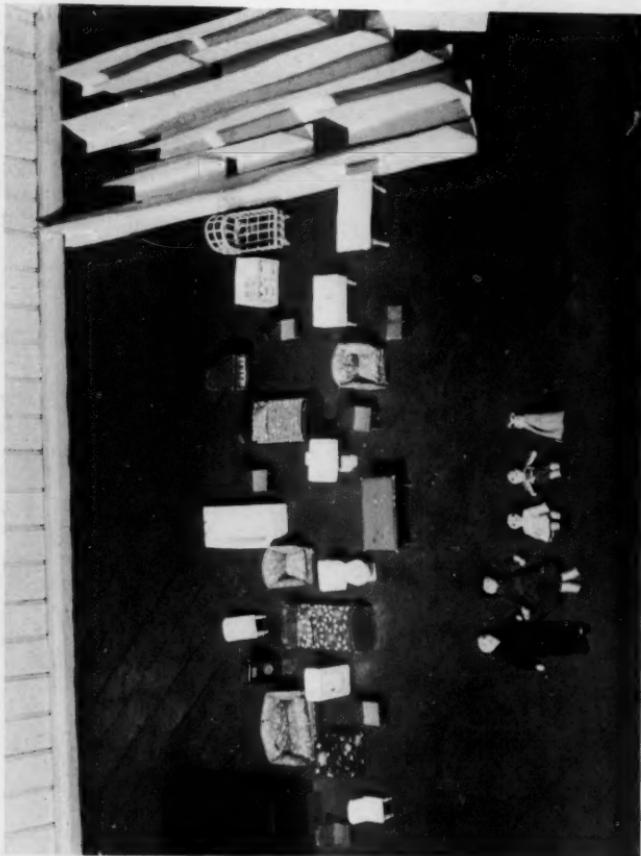
Nine of the subjects had had previous experience with doll play, having served as subjects in an earlier study. Two such sophisticated subjects were used in Group I, three in Group II, two in Group III, and two in Group IV. At least three months had elapsed between the former play sessions and the present ones in the case of each of these subjects, and the mean number of months which had intervened was 4.9.

#### Materials

The experimental materials consisted of cardboard strips, five dolls and a set of miniature household furniture. The cardboard strips were constructed of two layers of heavy cardboard and had projecting edges so that they might be stood upright to form the walls of the house. The height of the strips was three inches and the lengths varied. When the house was set up for organized presentation its length measured 38 inches and its width 25 inches.

The five dolls represented a family consisting of father, mother, a preschool-age girl, a preschool-age boy, and a baby.

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**Figure 1.** Unorganized presentation of materials.

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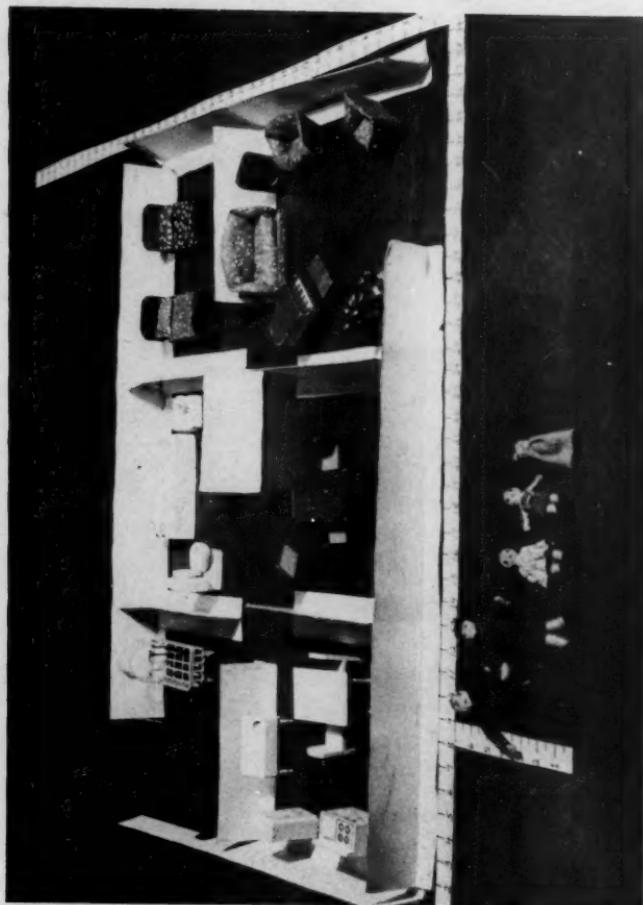


Figure 2. Organized presentation of materials.

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The dolls were life-like in appearance and were conventionally dressed. Their clothes were not removable. The dolls' heights were as follows: mother, six and one-fourth inches; father, six and one-half inches; boy and girl, three and one-half inches; baby, two and one-half inches. The furniture was proportional to the size of the dolls and was realistic in appearance. The pieces of furniture for the living room were a piano and stool, davenport, radio, and three easy chairs; for the dining room, a table and five chairs; for the kitchen, a sink, stove, icebox, table, and two chairs; for the two bedrooms, a large double bed, two smaller beds, and a crib; for the bathroom, a tub, toilet, and washbowl.

### Procedure

When the experimenter took the child from the preschool, she said, "I have some toys for you to play with across the street. We'll go over to see them now." Conversation with the child until he reached the experimental room consisted of any subject felt to be of interest to the child and of use in making the child aware of the experimenter as a friendly person. Upon entrance into the experimental room the experimenter went with the child to the toys, and said, "See, here are all the toys; you may play with them any way you like."

In the condition of low interaction with the child, the experimenter then said, "I have some work to do over here (went to table three or four feet away from child); you go ahead and play any way you like." The experimenter began scoring as soon as she was seated at the table.

In the condition of high interaction with the child, the experimenter sat down on the floor near the child and to his left, unobtrusively picked up her scoring sheet, looked at the experimental materials expectantly, and said, "You can play with them any way you like." Scoring was begun immediately.

The automatic timing device located in an adjoining booth was running from the time the child entered the experimental room. It made a buzzing sound every 15 seconds. If the child noticed this sound or asked about it he was told, "That sound is a clock in the other room. It makes that buzzing noise every 15 seconds. That's the way it keeps time."

In the low interaction situation, if the child asked the experimenter what she was doing at the table, he was told, "This is just some work I have to do," and the experimenter continued to devote herself to the scoring sheet and folder of papers which she had on the table. If the child came over to the table and asked about the symbols on the record sheet, he was told, "This

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is the way I keep track of the time."

In the high interaction situation where the recording was done in close proximity to the child, questions about this were likely to be more frequent. The experimenter answered such questions by saying, "I just keep track of the dolls and furniture this way," and tried to divert the child by saying either, "You can play with the toys any way you like," or, if play activity had been going on before, "Now, what's going to happen next?" Care was taken to prevent giving the child the idea that the actions of the dolls or his own verbalizations were being taken down.

At the end of 20 minutes, the experimenter said, "Well, our time is up for today; we'll go back to preschool now. Maybe you can come play with the toys some other time."

Each child took part in three 20-minute play sessions. At least one day intervened between any two sessions. Except for one subject, the time between sessions never exceeded one week. For the entire group, the average number of days elapsing between Sessions 1 and 2 was 1.82 days; and between Sessions 2 and 3, 1.78 days.

### Categories and Scoring

The child's behavior and his play (both thematic and non-thematic) were recorded by the use of the following symbols: E, exploring behavior; O, organizational behavior; Th, stereotyped thematic play; Th<sub>x</sub>, nonstereotyped thematic play; P, tangential play with the experimental materials; T, tangential behavior not involving the experimental materials; Ag, aggressive behavior of a thematic or nonthematic type.<sup>2</sup> The number of different themes and the time at which the dolls were first used by the subject were noted.

The child's behavior was recorded in terms of these symbols, a single symbol being used for each 15-second interval. If more than one type of activity occurred within any 15-second interval, the one occurring for the greatest length of time was recorded. Nonstereotyped or inappropriate organizational or thematic play, regardless of duration, was indicated by an x below the symbol in the time interval in which it occurred. Aggressive behavior was also recorded in conjunction with whatever other symbol was used to indicate the ongoing activity at the time.

The amount of experimenter interaction with the child was recorded by tally marks below each five-minute section of the

<sup>2</sup>For more complete description of scoring method, categories and reliability, see Phillips (7).

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record. Those interactions designed to keep the child in the experimental situation were recorded separately from those of a generalized or rapport type.

The final record for each session consisted of 60 notations in sequence, one for each 15-second interval, and additional notations for aggressions or nonstereotyped organizational or thematic play associated with some of the 60.

### Reliability

Reliability of the recorded observations was computed on the basis of four hours of doll play presented under the various conditions of this study and that of Phillips.<sup>3</sup> One observer sat behind a one-way screen and recorded the session independently of the other observer who was conducting the experimental play session.

Reliabilities for the various categories were computed on the basis of percentage of agreement using the following formula:

$$\frac{2 \text{ times the number of agreements of observers A and B}}{\text{Total observations of A plus the total observations of B}}$$

The percentages of agreement for the totals of each of the categories except one ran from .72 to .97. Tangential play, which occurred very infrequently (only 18 times in the four-hour period), had a reliability of .59. The mean reliability for all the categories (except tangential play) was .90.

In computing the reliability for the interactions of the experimenter with the child, the Pearson product-moment coefficient of correlation for raw scores was used. For both the rapport and tangential interactions in the high and low levels of stimulation, the coefficients of correlation ranged from .88 to 1.00.

### Results

For an evaluation of the differential effects of the variables of experimenter-child interaction and initial organization of materials, certain salient characteristics of doll play have been examined.

Table 1 shows the mean frequency of each category during the three 20-minute sessions of doll play for each of the experimental conditions. Note the wide variation in frequency for stereotyped organizational and nonstereotyped thematic play and thematic aggression for the different experimental conditions.

The amount of stereotyped thematic play, in terms of per-

<sup>3</sup>See Footnote 2.

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TABLE 1

MEAN FREQUENCY OF EACH CATEGORY DURING THREE  
20-MINUTE SESSIONS OF DOLL PLAY UNDER  
FOUR EXPERIMENTAL CONDITIONS  
(N = 10 IN EACH CONDITION)

Category	High inter. Unorg. mat.	High inter. Org. mat.	Low inter. Unorg. mat.	Low inter. Org. mat.
Exploratory	23.9	20.2	25.8	21.1
Organizational	69.3	24.7	74.6	46.4
Inapprop. organiz.	2.5	2.9	3.5	6.5
Thematic, stereo.	68.5	59.2	61.2	60.5
Self-thematic	1.4	12.9	1.9	.2
Nonhuman thematic	6.7	3.3	1.0	.1
Nonstereo. thematic	34.8	73.5	19.4	31.0
Tangential	26.1	32.9	40.1	51.3
Tangential play	6.8	10.6	12.5	22.9
Tangential and tang. play	32.9	43.5	52.6	74.2
Aggression				
Total	25.5	60.6	16.2	14.8
Thematic	24.5	57.9	10.1	13.9
Tangential	1.0	2.7	6.1	.9
No. of themes	5.9	6.2	4.4	3.3
Aggression latency*	32.1	17.6	55.8	53.2

\*In terms of median interval at which aggression began during the three sessions. The smaller the number, the earlier aggression occurred.

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centage of total thematic play, varied among the experimental conditions as follows:

High interaction	Organized materials	39.8%
High interaction	Unorganized materials	61.5%
Low interaction	Organized materials	65.9%
Low interaction	Unorganized materials	73.3%

High experimenter-child interaction in combination with an organized presentation of materials resulted in the lowest proportion of stereotyped thematic play.

Table 2 presents the mean differences and the reliability of these differences for each of the categories between different amounts of experimenter-child interaction and different degrees of organization of materials. Since the subjects had been matched on the basis of sex and chronological age, they were more likely to be similar than cases independently selected. The technique suggested by Lindquist (4, pp. 58-59) for use in such cases was followed. The difference for each pair was found and then, for this distribution of differences, it was determined whether or not the mean of the distribution (the mean difference) differed significantly from zero. The t-test for determining the significance of a difference in the means of related measures was used.<sup>4</sup>

Nonstereotyped thematic play, thematic aggression, total aggression, and the time at which aggression begins (i.e., its latency), were significantly different with different amounts of experimenter-child interaction. The different organizations of materials resulted in reliable differences at the 2 per cent level of confidence or less for the categories of stereotyped organizational behavior and thematic aggression.

Figure 3 represents the mean occurrence of tangential behavior and tangential play combined for the first, second, and third sessions of doll play under conditions of high and low experimenter-child interaction. Although the difference found in this category is reliable at less than the 10 per cent level for the sessions combined, it can be seen from the graph that the frequency of tangential behavior and tangential play increased more rapidly under conditions of low interaction than high interaction as the sessions progressed. The mean difference for this category computed for the third sessions only was

<sup>4</sup>The formula (4, p.59) used was  $t = \frac{M_O - M_H}{\sqrt{\frac{d^2}{n(n-1)}}}$

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TABLE 2

MEAN DIFFERENCES UNDER CONDITIONS OF HIGH AND LOW  
EXPERIMENTER-CHILD INTERACTION AND ORGANIZED  
AND UNORGANIZED PRESENTATION OF MATERIALS  
(N = 40)

Category	High and low experimenter-child interaction		Organized and unorganized presentation of materials	
	Mean diff.*	p	Mean diff.	p
Exploratory	-1.4	80	-4.2	40
Organizational	-13.5	20	-36.4	1
Inapprop. organiz.	-2.3	50	1.7	60
Thematic, stereo.	3.0	80	-6.1	60
Self-thematic	6.1	30	4.9	40
Nonhuman thematic	4.4	5	-2.2	20
Nonstereo. thematic	29.0	1	22.2	5
Tangential	-16.2	20	9.0	50
Tangential play	-9.0	40	7.1	50
Tangential and tang. play	-25.2	10	16.1	30
Aggression				
Total	27.6	1	16.8	5
Thematic	29.2	1	18.6	2
Tangential	-1.6	60	-1.8	50
No. of themes	2.2	5	- .4	70
Aggression latency**	29.6	1	8.6	20

\*Positive differences are in favor of high experimenter-child interaction or organized presentation of materials. Negative differences in favor of low experimenter-child interaction or unorganized presentation of materials.

\*\*Medians used in this computation. Positive differences indicate aggression entered earlier with high experimenter-child interaction and with the organized presentation of materials.

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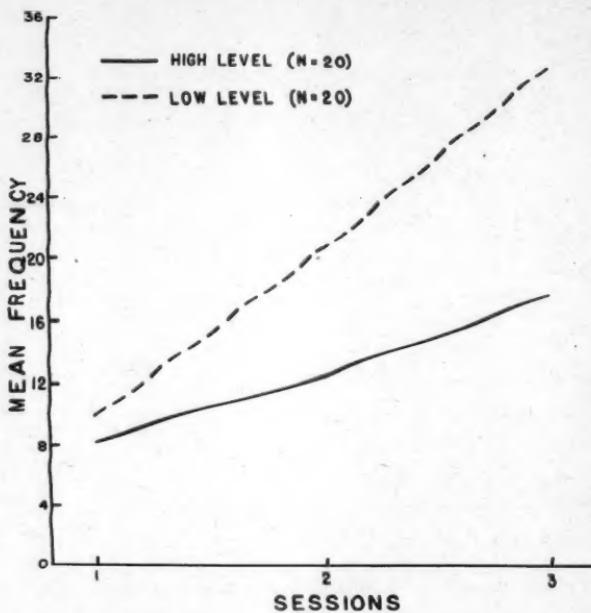


Figure 3. Mean frequency of tangential and tangential play behavior during three sessions of doll play with high and low levels of experimenter-child interaction.

found to be reliable at the 5 per cent level.

Figure 4 shows the median time at which aggression occurred during Sessions 1, 2, and 3 for the total group of 40 subjects. It is apparent that aggression tended to enter earlier as the sessions progressed.

### Discussion

The findings of this study are discussed under the headings of the main categories used in recording behavior during the play sessions.

#### Exploratory

Exploratory behavior of the child during doll play was not reliably affected by either of the variables of this study.

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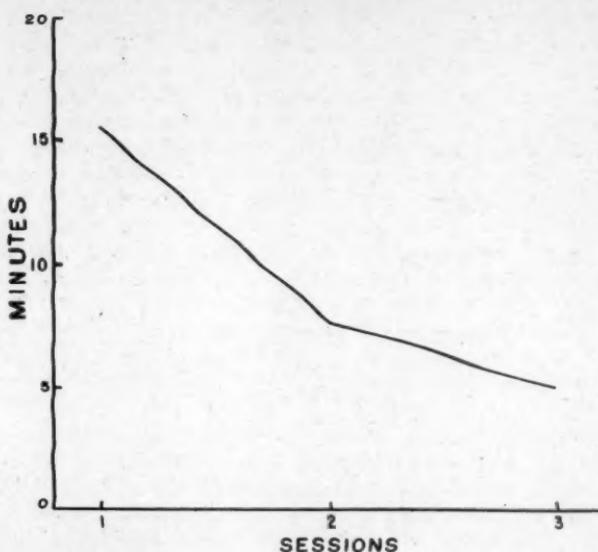


Figure 4. Median latency of first occurrence of aggression during three 20-minute sessions of doll play ( $N = 40$ ).

Organizational

As would be expected, this type of behavior was found to be highly related to the way in which the materials were presented. When the materials were offered in an unorganized fashion the child exhibited a large amount of stereotyped organizational behavior. The difference found in this category under conditions of organized versus unorganized presentation of the materials was significant at less than the 1 per cent level. There is slight evidence (reliable at the 20 per cent level) that low interaction between experimenter and child also leads to a greater frequency of stereotyped organizational behavior.

Nonstereotyped or inappropriate organizational activity occurred infrequently under all conditions, and was not reliably affected by the two variables studied.

Stereotyped Thematic

This type of behavior, characterized by appropriateness of the doll action to the time, place, and situation, was not reliably

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affected by either the amount of experimenter-child interaction or the degree of organization of materials. This finding may be of value to the therapist concerned with setting up the most advantageous conditions for procuring this type of activity, if later studies reveal that such stereotyped activity simulates the actual conditions of the child's every-day life. This was one of the most frequently occurring categories under all the conditions of this study. The finding that stereotyped thematic play comprised a much smaller percentage of total thematic play under conditions of high interaction combined with organized materials was due more to the increase of other types of thematic activity under this condition than to any lessening in the amount of stereotyped thematic play itself.

### Nonstereotyped Thematic

It is of particular interest to find that nonstereotyped thematic play is reliably related to the level of experimenter-child interaction (reliable at less than the 1 per cent level). This category includes the inappropriate, distorted types of doll action which are felt by many therapists to give insight into the underlying causes of the child's adjustment difficulties. It should be remembered that the high level of interaction used in this study consisted of stimulation of a most general sort.

• There was no pressure put on the child to carry out or extend a particular theme. It was the impression of the experimenter that the friendly interaction between the child and herself tended to allay any tension and anxiety the child may have felt, and thus made him feel free to indulge in generally-forbidden acts. After the child began unconventional doll acts and found that the experimenter offered no objections to such activity, anxiety was further diminished. Recognition of the effect of such interaction between experimenter and child should be of use to the therapist interested in stimulating this type of doll play. There is slight evidence (reliable at less than the 5 per cent level) that the organized presentation of materials also contributes to the more frequent occurrence of nonstereotyped doll actions.

The category of nonhuman thematic activity occurred with low frequency under all the conditions of this study. None of the differences found were highly reliable, though there is some evidence (reliable at less than the 5 per cent level) that conditions of high interaction favor the occurrence of this. It is interesting to note that this kind of activity occurred in only 17 of the 40 subjects used. Of this 17, only seven children contributed five or more instances of such behavior during the three sessions.

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Likewise, the category of self-thematic play occurred infrequently. Only 13 of the 40 subjects ever exhibited this type of behavior, and out of this number only four children contributed five or more instances during the three sessions.

The fact that both nonhuman thematic play and self-thematic play are utilized by only certain children suggests that further study might profitably be made to discover whether the use of this type of play is indicative of any particular pattern of adjustment on the part of the child.

### Tangentiality

It was expected that in the high interaction situation, the experimenter's attempts to limit the boundary of the situation to the experimental materials themselves would result in a lessening of all tangential behavior. This did not prove to be the case. For tangential behavior, tangential play, and the combination of these two, no reliable differences were found, although the trend was in the expected direction. It is worth while to note that although under high and low levels of interaction the frequency of all tangential behavior was approximately the same during the first session of play, the increase in frequency during the next two sessions was at very different rates. By the third session the difference in frequency was significant at the 5 per cent level, with high interaction favoring less tangentiality.

The variable of organization of materials does not reliably affect the amount of tangential behavior found, though here the tendency is in the direction of high organization contributing to greater tangentiality.

### Aggression

Thematic aggression, that is, aggression as a part of a theme which is being played out, was found to be reliably related to both of the variables of this study. A significantly greater amount of thematic aggression was found under conditions of high interaction than under low interaction (reliable at less than the 1 per cent level). An organized presentation of materials also led to a reliably greater amount of this type of aggression (less than the 2 per cent level). In view of the wide use which is made of doll play as release or abreaction therapy, this finding is of particular importance.

Tangential aggression, that is, any aggression which occurred apart from thematic production, showed no reliable differences with either of the variables of this study.

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When thematic and tangential aggression were combined, the difference in favor of high interaction was still reliable at the 1 per cent level. For the organization variable the difference was significant at less than the 5 per cent level, with the organized presentation of materials leading to greater aggression.

In the high interaction situation aggression began reliably earlier than under any of the other experimental conditions. It is also of interest to note that aggression tended to enter earlier as the sessions progressed. For the entire group of 40 subjects, the median time at which aggression first appeared during Session 1 was after 15 minutes of activity. By the second session, aggression entered after seven minutes, and in the third session by the end of five minutes. This might indicate a lessening of inhibition on the part of the child, due to the fact that his earlier aggressive actions had met with no criticism from the experimenter.

### Number of Theme Changes

The number of theme changes was greater under conditions of high interaction (reliable at the 5 per cent level) than under conditions of low interaction. The organizational variable was not reliably related to this category.

It is of interest to compare these findings with those of Bach (1) in regard to the effect of experimenter-child interaction. Bach defined the function of each type of stimulation which was used with the child, but did not hold constant the amount of stimulation which the child received. That is, a greater amount of stimulation was given to the thematically nonproductive subject than to the productive one. He did not record general rapport stimulation, and many of the types of stimulation which he did use, such as stimulation in the direction of a specific theme, identification stimulation, and actual demonstration of sequences, were not used in the present study.

Bach found a correlation coefficient of -.055 between total amount of verbal stimulation and the relative frequency of occurrence of all kinds of nonstereotyped actions. In the light of the present study it would seem reasonable to suppose that this low correlation might be explained by the fact that the amount of stimulation was varied according to the apparent need of the child. The lower amount of stimulation given to the thematically productive child may not have provided the optimum condition for the production of nonstereotyped fantasy, while the higher stimulation of the thematically nonproductive child may have provided for the greater occurrence of this type of response. Thus the children would tend to be somewhat equated in their

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production of nonstereotyped responses by the amount of stimulation which the experimenter gave, and no one to one relationship would be revealed between amount of stimulation and productivity of nonstereotyped responses.

Other workers utilizing doll play have, on the whole, been content with defining the interaction between experimenter and child in very general terms. Despert (3), for example, defines the experimenter's role as one of "passive participation" since no ideas, suggestions, or interpretations are made by the experimenter. However, the experimenter does give a great deal of encouragement and asks numerous questions of a what, why, and how nature. Since the present study has shown such a significant relationship between amount of experimenter - child interaction and amount of nonstereotyped and aggressive fantasy production, it would seem that this factor should be carefully controlled wherever a comparison of the play records of children is desired.

Lowenfeld (5) and Murphy (6) have stressed that the way in which a child organizes or patterns the play materials may be of clinical significance. The present study made no attempt to analyze organizational behavior into various categories. It is obvious that when one wants to study organizational behavior, *per se*, an unorganized presentation of materials will lead to a greater occurrence of this type of behavior. However, the finding that an organized presentation of materials leads to a greater expression of aggression during doll play should be of interest to those who are not concerned with organizational behavior in and of itself.

### Conclusions

1. The amounts of exploratory and tangential behavior and stereotyped thematic play were not reliably affected by either of the variables studied.
2. An unorganized presentation of materials led to greater frequency of organizational behavior.
3. The amount of nonstereotyped thematic play and the number of theme changes were both reliably greater under conditions of high interaction between the experimenter and child.
4. The categories of nonhuman and self-thematic play were utilized by comparatively few children.
5. Thematic aggression was reliably greater in amount under conditions of high experimenter-child interaction and under organized presentation of materials.
6. Aggression began earlier under conditions of high interaction. Aggression also tended to begin earlier as the sessions progressed.

## CHILD DEVELOPMENT

### REFERENCES

- (1) Bach, G. R. Young children's play phantasies. *Psychol. Monog.*, 1945, No. 272. Pp. 69.
- (2) Chittenden, G. E. An experimental study in measuring and modifying assertive behavior in young children. *Monog. Soc. Res. Child Develop.*, 1942, 7, No. 1. Pp. 1-87.
- (3) Despert, J. L. A method for the study of personality reactions in preschool age children by means of analysis of their play. *J. Psychol.*, 1940, 9, 17-29.
- (4) Lindquist, E. F. *Statistical analysis in educational research*. New York, Houghton Mifflin Co., 1940. Pp. 266.
- (5) Lowenfeld, M. The world pictures of children. A method of recording and studying them. *Brit. J. Med. Psychol.*, 1939, 18, 65-101.
- (6) Murphy, L. B. Experiments in free play. (In) Lerner, E., Murphy, L. B., and others: *Methods for the study of personality in young children*. *Monog. Soc. Res. Child Develop.*, 1941, 6, No. 4. Pp. 289.
- (7) Phillips, R. Doll play as a function of the realism of the materials and the length of the experimental session. *Child Develop.*, 1945, 16, 123-143.
- (8) Rogerson, C. H. *Play therapy in childhood*. New York, Oxford University Press, 1939. Pp. 64.

## CREATINE EXCRETION IN ADOLESCENTS<sup>1</sup>

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Previous studies have indicated that whereas creatine is found in the urine of young children, it is normally absent in the urine of adult males, and appears only sporadically and at low concentrations in the urine of adult females (12, 24). Since the creatine excretion which reappears in aged men and women past the menopause may be reduced or abolished by the administration of sex hormones (32), it is possible that the cessation of creatine excretion might serve as a useful index of sexual maturity in children. In order to test this hypothesis, urinary creatine measurements were included in a cumulative study of adolescence carried out by the Institute of Child Welfare at the University of California (14). The results of these analyses serve as the basis for the following report.

### Experimental

Subjects. The subjects for the cumulative study were 50 girls and 50 boys chosen from the University of California Adolescent Growth from five elementary schools of Oakland, California.<sup>2</sup> Since repeated testing of the same subjects was contemplated, selection of the subjects was based on the probability of their permanent residence and the cooperation shown by their parents. Although the children had a mean age of 11.87 years (S.D. = 0.5 year) when the study was begun, laboratory facilities for urine analysis were not available until the children had attained a mean age of 13.5 years. Each child was re-tested at intervals of 6 months over a 5-year period. Although

<sup>1</sup>From the Institute of Child Welfare and the Division of Physiology, University of California, Berkeley. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration O. P. 465-03-3-631, Unit A-8 and O. P. 65-1-08-62, Unit A-8. The staff of the Oakland Public Schools cooperated in making the subjects available for study. During the course of the investigation Mrs. Olga Nave, Mr. Theodor Chernikoff, Miss Helen Brien, Mr. P. M. Tuttle, and Mrs. Katherine Heck Long rendered valuable technical assistance.

<sup>2</sup>A more detailed description of the procedure and methods used in this study is given by Jones (14).

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the total number of children in the sample was 100, the number of urine specimens obtained varied somewhat from year to year, giving an N of 20-30 for girls, and 30-42 for boys.

Procedure. Morning urine samples, representing the night-time excretion were obtained on two successive mornings from each subject, at 6-month intervals. Urinary volume and specific gravity were recorded. Qualitative tests for sugar and albumen, and quantitative estimates of creatine, creatinine, and total nitrogen were made. Night urine samples were employed chiefly because the night urines represented the excretion of a period which was relatively more standard for the group and minimized the effect of certain factors, such as sunlight (7) or muscular activity, which may influence the creatine and creatinine output (20, 41). Furthermore, the use of night urines obviated the difficulty of 24-hour urine collections which could not have been accomplished in a large group of normal children of the ages studied. In a series of preliminary tests it was found that, although the amount of creatine and creatinine excreted was less during the night than during the day (11), creatinuria did not disappear at night, as reported by Denis and Minot (6), or Powis and Rapier (27). Since creatinuria is influenced by a number of factors which may vary during the day, there is, perhaps, greater physiological significance to night time creatinuria.

Analysis for creatine and creatinine were carried out by the Benedict modification (1, 2) of the method of Folin (10). Basal metabolism determinations were made on each day by the Tissot open circuit method (35). Anthropometric measurements, including height, weight, and stem length (length from top of head to ischial tuberosities) were made in duplicate on each child.

Treatment of data. The level of creatine excretion was estimated in each urine sample by calculating the ratio of creatine to creatinine concentration in the same sample. This calculation eliminated the effect of urine dilution or concentration following changes in water intake and minimized the effect of body size. The efficacy of this procedure was tested in 6 subjects who furnished complete 24-hour urine samples. The creatine excretion per unit of creatinine content (creatinine/creatinine ratio) of the night specimens gave essentially the same values as those obtained from 24-hour urine specimens analyzed on two different occasions for each subject.<sup>3</sup>.

<sup>3</sup>The mean creatine/creatinine ratio for night-urines of six subjects was .087, whereas the mean value for 24-hour specimens collected at the same time was .081.

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The average values for creatine concentration per unit of creatinine (creatine/creatinine ratio) were calculated for the duplicate analyses made on two successive days. Averages were calculated according to chronological ages. Individual curves were also plotted and compared with growth curves of height, weight, stem length, basal metabolism, and other measurements taken at the same time on each subject.

### Results

Reliability. The correlations between measurements of the creatine/creatinine ratio made on two successive days varied between  $0.72 \pm .07$  and  $0.83 \pm .05$  for different ages.<sup>4</sup> No systematic change in reliability with age or sex was observed. The correlation between determinations made at 6-month intervals dropped to  $0.32 \pm .10$ . These correlations indicate a fair degree of reliability when the mean of observations on two days are used. They also show that significant changes in the creatine/creatinine ratio occur in children over intervals as short as 6 months.

Changes in the creatine/creatinine ratio with age. Average values of the creatine/creatinine ratio at increasing ages are shown in Table 1 and Figure 1. In these children the average creatine/creatinine ratio increased between the ages of 13.5 and 14.5 years in both boys and girls. Although the average values decreased gradually after the age of 14.5 years, it is worthy of note that some of the children were still excreting appreciable amounts of creatine at the age of 18 years. The ratio was usually higher for girls than for boys but the difference is not statistically reliable. While the gradual decrease with chronological age in the average values for the creatine/creatinine ratio does not exclude the possibility that in individual children the excretion of creatine ceases abruptly, examination of individual age curves failed to indicate any such tendency. In other words, the downward trend in creatine excretion was gradual in the individual as well as the average growth curves. Examples of such individual curves are presented in Figure 5 of a following section.

Relationship between creatine/creatinine ratio and basal oxygen consumption. Since it has been shown that creatine excretion is increased in hyperthyroidism (41) and decreased in

<sup>4</sup>Similar correlations for creatine or creatinine content of the urine specimens expressed as mg. per 100 cc ranged between  $0.37 \pm .10$  and  $0.59 \pm .08$ . This offers evidence of the increased reliability of the creatine/creatinine ratio.

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TABLE I  
AGE CHANGES IN CREATINE/CREATININE RATIO

Age	Creatine/Creatinine Ratio			
	Boys		Girls	
	Mn	$\sigma_{Mn}$	Mn	$\sigma_{Mn}$
13.5	.0096	.010	.0018	.010
14.0	.0378	.010	.0522	.011
14.5	.0876	.011	.1066	.018
15.0	.0852	.010	.0882	.012
15.5	.0596	.008	.0797	.011
16.0	.0621	.010	.0883	.012
16.5	.0817	.008	.0469	.009
17.0	.0435	.008	.0746	.010
17.5	.0451	.009	.0727	.011
18.0	.0205	.010	.0153	.015

cretins (44), the correlation between the creatine/creatinine ratio and the basal metabolism was calculated. The correlation coefficients ranged between  $0.10 \pm .08$  and  $0.25 \pm .06$  at different ages of the children in the present study. All the coefficients were positive, but their magnitude was too low for effective prediction. In order to test the possibility that creatine/creatinine ratio was correlated with changes in basal metabolism in the same individual, the individual growth curves for basal metabolism and creatine/creatinine ratio were compared. Although instances were found in which periods of rapidly decreasing basal metabolism were associated with diminished creatine/creatinine ratio, there were also many instances in which rapid changes in basal metabolism were not associated with any systematic change in creatine/creatinine ratio - or the change was in the opposite direction. Hence, no significant relationship between either level of basal metabolism or change in basal metabolism and creatine excretion could be demonstrated in the normal children of the present study.

Relation between creatine/creatinine ratio and rate of growth. Growth rates were estimated for each child by calculating the increment per 0.1 year in the anthropometric measurement under consideration. Figure 2 shows a plot of the average increments in stem length and weight in the boys of the present study. This curve shows that the maximum in creatine excretion observed in boys occurs at about the same time as the maximum growth in stem length, but lags behind

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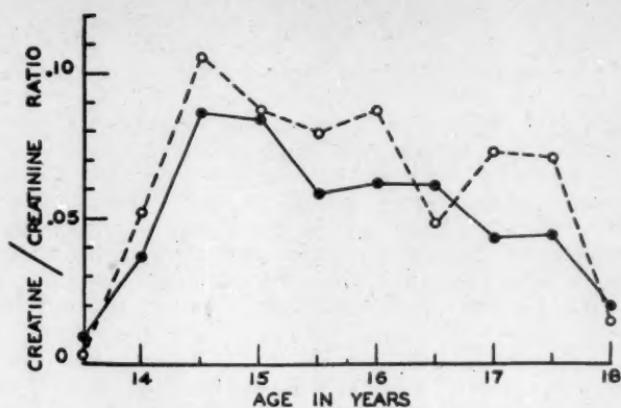


Figure 1. Age changes in creatine/creatinine ratio. Average curves for boys and girls: ●—● Boys; ○—○ Girls.

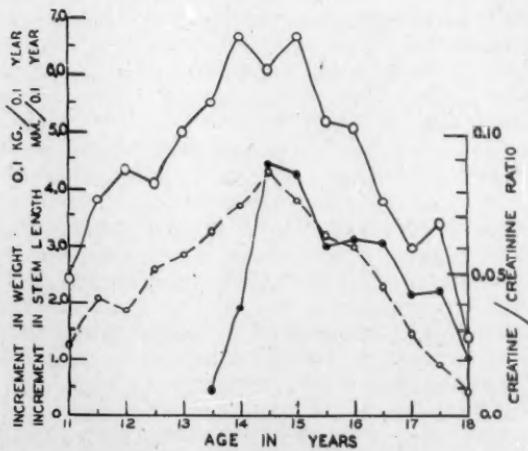


Figure 2. Relationship between growth increments and creatine/creatinine ratio in boys. Average curves: ○—○ Growth increment in stem length; ●—● Growth increment in weight; ○—○ Creatine/creatinine ratio.

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the period of maximum growth in weight. Since no urine analyses were made at the early ages when maximum growth rates were present in the girls, data for a similar analysis were not available.

Relation between creatine/creatinine ratio and increments in muscle strength. Muscle strength measurements were made with the hand dynamometer. Three trials were made with right hand grip, left hand grip, thrust, and pull. The sum of the highest values (in kgs.) for each measure was used as the strength score. Growth curves for muscle strength were estimated by determining the increments in strength in kgs. per 0.1 year. Figure 3 shows the average increments in strength for boys at each age. Examination of these curves shows a correspondence between increments in strength and creatine excretion. Sufficient observations on the girls at early ages were not available to permit a similar analysis.

Relation between creatine/creatinine ratio and maturity. Since creatine measurements were not obtained until the children of the study had reached the age of 13 years, and since 80 per cent of the girls in the study attained sexual maturity (as indicated by first menstruation) before the age of 13.5 years, an analysis of the creatine data on the basis of age deviation from menarche was not feasible.<sup>5</sup> However, examination of individual growth curves of creatine excretion in the girls of the study with menarcheal ages greater than 13.5 years showed a definite rise in creatine excretion just prior to menarche followed by a rapid fall. Sample growth curves for individual children are shown in Figure 4.

It was also found that girls who had matured early showed lower creatine excretion at all ages for which data were available than girls who matured late. Figure 5-A compares the average creatine/creatinine ratio for a group of 8 girls who matured early (mean age at menarche = 11.5 years) with the average creatine/creatinine ratio of a group of 8 girls who matured late (mean age at menarche = 14.6 years). This curve shows that the creatine/creatinine ratio is lower in the early maturing girls between the ages of 14 and 16 years. When the age of maximum increase in stem length is used as the criterion of early or late maturity (37), similar results are obtained for both boys and girls, i.e., early maturing children show lower creatine/creatinine ratios than do late maturing children (see Figure 5-B and C).

<sup>5</sup>Such an analysis has been presented for basal metabolism, pulse rate, blood pressure, etc., in a previous publication (36).

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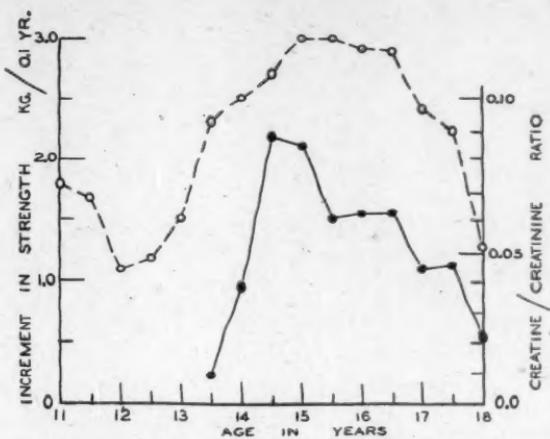


Figure 3. Relationship between increments in muscle strength and creatine/creatinine ratio in boys. Average curves;  
 ○ — ○ Increment in muscle strength; ● — ● Creatine/creatinine ratio.

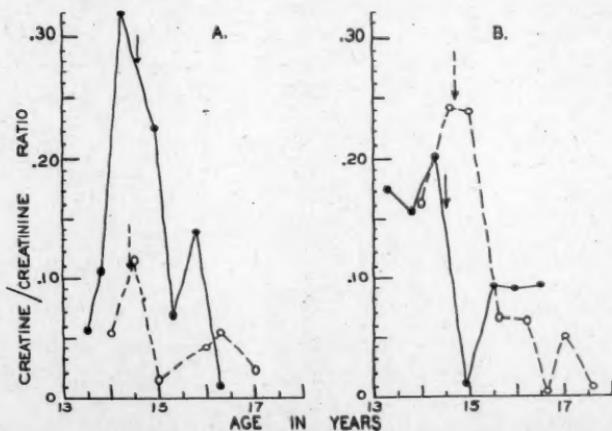


Figure 4. Individual growth curves of creatine/creatinine ratio in late maturing girls. Curves showing fall in creatine/creatinine ratio after beginning of menstruation. Arrow indicates age at first menstruation. A. ● — ● Case 139; B. ○ — ○ Case 217. B. ● — ● Case 103; ○ — ○ Case 127.

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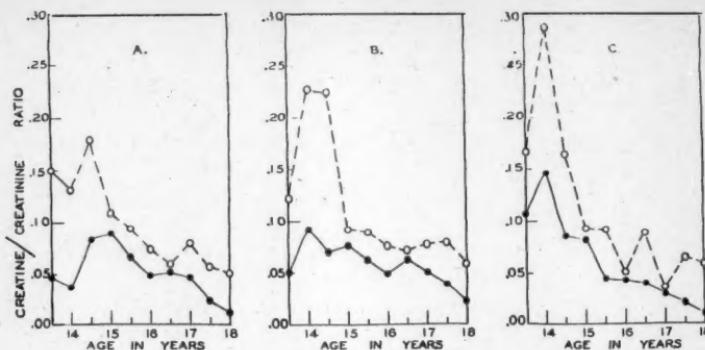


Figure 5. Average creatine/creatinine ratios in early and late maturing children. A. Girls - maturity groups based on age of first menstruation: ●—● Average creatine/creatinine ratio of 8 girls with mean age of menarche of 11.5 years; ○—○ Average creatine/creatinine ratio of 8 girls with mean age of menarche of 14.6 years. B. Girls - maturity groups based on age of maximum growth rate in stem length: ●—● Average creatine/creatinine ratio of 8 girls with mean age of maximum growth in stem length of 11.4 years; ○—○ Average creatine/creatinine ratio of 8 girls with mean age of maximum growth in stem length of 14.1 years. C. Boys - maturity groups based on age of maximum growth rate in stem length: ●—● Average creatine/creatinine ratio of 8 boys with mean age of maximum growth in stem length of 13.5 years; ○—○ Average creatine/creatinine ratio of 8 boys with mean age of maximum growth in stem length of 16.0 years.

### Discussion

Creatine appears in the urine of infants within the first few days of life (34, 38), and continues to be present throughout childhood (13, 16, 17, 20, 22, 28, 30, 39, 42, 43). However, in these studies relatively few children were observed at each age level, and in none were observations repeated on the same child. Calculation of the creatine/creatinine ratio from observations in the above papers yield high values (range: .124 - .790) for children even up to the age of 15 (see Table 2). The only systematic study of cretinuria in adolescents is that of Light and Warren (20). Re-calculation of their data shows creatine/creatinine ratios progressively diminishing from .113 at age 14 to

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TABLE 2  
CREATINE/CREATININE RATIOS IN CHILDREN  
(RE-CALCULATION OF DATA FROM THE LITERATURE)

Age	N	Boys		Girls	
		Mean Ratio	Reference	Mean Ratio	Reference
		Creatine Creatinine		Creatine Creatinine	
1.5	1	.329	Rose (30)	.790	Rose (30)
3	-	--	---	.742	Rose (30)
4	1	.532	Rose (30)	--	---
5	1	.422	Rose (30)	.263	Rose (30)
5	1	.162	Taylor (39)	--	---
7	-	--	---	.582	Rose (30)
8	-	--	---	.572	Rose (30)
8	-	--	---	.249	Taylor (39)
9	-	--	---	.395	Wang, Frank, Kern and Hays (42)
10	3	.213	Rose (30)	--	---
11	2	.223	Rose (30)	.237	Rose (30)
11	-	--	---	.666	Wang, Genther and Hogden (43)
12	1	.737	Rose (30)	.616	Rose (30)
12	-	--	---	.718	Wang, Genther and Hogden (43)
13	1	.124	Rose (30)	.246	Rose (30)
13	-	--	---	.681	Wang, Genther and Hogden (43)
14	1	.511	Rose (30)	.487	Wang, Genther and Hogden (43)
14	5	.113	Light and Warren (20)	--	---
15	1	.445	Rose (30)	.367	Rose (30)
15	11	.075	Light and Warren (20)	.236	Wang, Genther and Hogden (43)
16	10	.065	Light and Warren (20)	--	---
17	7	.033	Light and Warren (20)	--	---
18	1	.014	Light and Warren (20)	--	---

.014 at age 18, as shown in Table 2. These results are in agreement with the present study. The low values of the creatine/creatinine ratio which were obtained in the 13-13 1/2 year-olds of the present study were not observed by others in the few cases where measurements have been made on children of this age. Hence, it is clear that additional observations should be made on children ages 8-14 to determine whether creatine excretion diminishes at this age to rise again during the adolescent period.

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Although it has been shown that creatine excretion is increased in hyperthyroidism (8, 13, 15, 25, 41), and decreased in hypothyroidism (33, 44), no correlation between basal metabolic rate and creatine/creatinine ratio could be demonstrated in the present study. This lack of correlation may be due to the restricted range of basal metabolism measurements found in a group of normal children.

The concept that creatine disappears abruptly from the urine with the attainment of sexual maturity is not supported either by the data from the literature or the present observations (see Tables 1 and 2). However, the degree of creatinuria of normal adults on ordinary diets is much less than that of children and the tolerance to ingested creatine is much greater in adults than in children. Remen (29) and Krause (16, 17) have shown that normal adult males excrete no more creatine on days when creatine was given in the diet than on previous days. On the contrary, when creatine was fed to children or castrates (28), it was largely excreted in the urine unchanged. Beumer and Fasold (4) and Fasold (9) have shown that in precocious children without signs of sexual development, creatinuria is present, while in precocious with accelerated sexual development as well, spontaneous creatinuria disappeared and ingested creatine was not excreted as such. In senile individuals with diminished sexual function, spontaneous creatinuria reappears in both men and women and ingested creatine is again excreted as such (5, 19, 21, 31, 32, 45). A number of experimenters have been able to bring about the disappearance of the spontaneous creatinuria in old men by the administration of male sex hormone. Creatinuria continues throughout life in eunuchs but is diminished when sex hormones are administered (28). These experiments lend support to the view that creatine utilization in the body is associated with the functional activity of the sex glands.

The results of the present study show that with attainment of sexual maturity, diminution in creatine excretion follows. It is also shown that in early maturing individuals creatine excretion is less than in late maturing ones. Although the creatine/creatinine ratio cannot be used as a single index of maturity, when taken in conjunction with other physiological indices, such as growth rate, strength, increments, basal metabolism, osseous development, etc., it may aid in establishing the degree of maturity of the individual.

## N. W. SHOCK

### Summary

Measurements of creatine and creatinine were made on morning urine specimens from 30 girls and 40 boys. Urine specimens were collected on each of two successive mornings at 6-month intervals in the same children between the ages of 13.0 and 17.5 years. The ratio of creatine to creatinine content of the same urine sample was calculated and used in the data analysis. Results showed a maximum in the average output of creatine in both boys and girls at the age of 14.5 years, which in the boys was associated with maximum growth rate in stem length. In both boys and girls maximum creatine/creatinine ratios were found associated with periods of maximum increase in muscular strength. No correlation between creatine/creatinine ratio and basal metabolism could be demonstrated. In late maturing girls, there was an increase in the creatine/creatinine ratio either before or at menarche, followed by a rapid fall thereafter. In both boys and girls, children who matured early showed lower creatine/creatinine ratios at a given chronological age than those who matured late.

### BIBLIOGRAPHY

- (1) Benedict, S. R. Studies in creatine and creatinine metabolism. II. The estimation of creatine. *J. Biol. Chem.*, 1914, 18, 191-194.
- (2) Benedict, S. R. A note on the purification of picric acid for creatinine determinations. *J. Biol. Chem.*, 1929, 82, 1-3.
- (3) Beumer, H. Kreatintoleranz bei Kinder. *Ztschr. f. Kinderh.*, 1921, 31, 236-246.
- (4) Beumer, H., and Fasold, H. Der Abbau Alimentären Kreatins als spezifisch Reaktion des geschlechtsreifen Organismus. *Klin. Wchnschr.*, 1931, 10, 937-938.
- (5) Bühler, F. Über den Einfluss der Sexualhormone auf den Kreatinstoffwechsel. *Ztschr. f. d. ges. exper. Med.*, 1933, 86, 638-644.
- (6) Denis, W., and Minot, A. S. A note on the diurnal variations in creatine excretion. *J. Biol. Chem.*, 1917, 29, 447-451.
- (7) Eichelberger, M. The effect of light on creatinine and creatine excretion and basal metabolism. *J. Biol. Chem.*, 1926, 69, 17-28.
- (8) Eimer, K. Beziehungen der Kreatinkörperausscheidung zu Stoffwechsel und Schilddrüsenfunktion. *Ztschr. f. d. ges. exper. Med.*, 1931, 77, 455-475.

## CHILD DEVELOPMENT

- (9) Fasold, H. Über den Kreatinstoffwechsel bei Pubertas praecox. *Ztschr. f. Kinderh.*, 1931, 51, 527-534.
- (10) Folin, O. On the determination of creatinine and creatine in urine. *J. Biol. Chem.*, 1914, 17, 469-473.
- (11) Folin, O., and Denis, W. On creatine in the urine of children. *J. Biol. Chem.*, 1912, 11, 253-256.
- (12) Hunter, A. Creatine and creatinine. New York, Longmans, Green & Co., 1928. Pp. vii + 281.
- (13) Iseke, C. Kreatinstoffwechsel und Schilddrüse. *Monatsschr. f. Kinderh.*, 1921, 21, 337-350.
- (14) Jones, H. E. The adolescent growth study. I. Principles and methods. II. Procedures. *J. Consult. Psychol.*, 1939, 3, 157-159 & 177-180.
- (15) Kepler, E. J., and Boothby, W. M. Creatinuria and hyperthyroidism. *Am. J. M. Sc.*, 1931, 182, 476-483.
- (16) Krause, R. A. On the urine of women under normal conditions, with special reference to the presence of creatine. *Quart. J. Exper. Physiol.*, 1911, 4, 293-304.
- (17) Krause, R. A. On age and metabolism and on the significance of the excretion of creatine. *Quart. J. Exper. Physiol.*, 1914, 7, 87-101.
- (18) Kun, H., and Peczenik, O. Geschlechtsspezifische Wirkung der Sexualhormone auf den Kreatinstoffwechsel. *Pflügers Arch. f. d. ges. Physiol.*, 1935, 236, 471-480.
- (19) Lasch, F. Über den Einfluss der erlöschenen Sexualdrüsensfunktion auf den Kreatinstoffwechsel. *Ztschr. f. d. ges. exper. Med.*, 1932, 81, 314-320.
- (20) Light, A. B., and Warren, C. R. Creatinuria among adolescent males. *J. Biol. Chem.*, 1934, 104, 121-128.
- (21) McNeal, M. D. The male sexual gland in the prevention of creatinuria. *Am. J. M. Sc.*, 1922, 164, 222-227.
- (22) Marples, E. Creatinuria in infancy and in childhood. *Am. J. Dis. Child.*, 1942, 64, 996-1007.
- (23) Muhlbock, O., and Kaufmann, C. Ist die Fähigkeit, exogenes Kreatin abzubauen eine spezifische Reaktion des geschlechtsreifen Organismus? *Arch. f. Gynäk.*, 1932, 151, 706-709.
- (24) Myers, V. C. Review: creatine and creatinine. *Yale J. Biol. & Med.*, 1931-1932, 4, 467-484.
- (25) Palmer, W. W., Carson, D. A., and Sloan, L. W. The effect of iodine on creatinuria in hyperthyroidism. *J. Clin. Investigation*, 1929, 6, 597-608.
- (26) Paschkis, K., and Schworer, A. Ueber geschlechtsun-  
spezifische Wirkung des männlichen Sexualhormones  
in Kreatinstoffwechsel. *Arch. internat. de pharmacodyn.  
et de thérap.*, 1936, 52, 218-229.

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- (27) Powis, F., and Rapier, H. S. Creatinuria in children. *Biochem. J.*, 1916, 10, 363-375.
- (28) Read, B. E. The metabolism of the eunuch. *J. Biol. Chem.*, 1921, 46, 281-283.
- (29) Remen, L. Kreatinurie und Ovarialfunktion. *Ztschr. f. d. ges. exper. Med.*, 1932, 81, 223-226.
- (30) Rose, W. C. Experimental studies on creatine and creatinine. III. Excretion of creatine in infancy and childhood. *J. Biol. Chem.*, 1911-12, 10, 265-270.
- (31) Schittenhelm, A., and Bühler, F. Die Spontankreatinurie bei Innersekretorischen Störungen; ihr Vorkommen und ihr Diagnostischer Wert. *Ztschr. f. d. ges. exper. Med.*, 1935, 95, 181-196.
- (32) Schittenhelm, A., and Bühler, F. Die Beeinflussbarkeit der Spontankreatinurie innersekretorischer Störungen durch Sexhormone. *Ztschr. f. d. ges. exper. Med.*, 1935, 95, 197-206.
- (33) Schittenhelm, A., and Bühler, F. Die Beeinflussbarkeit der Spontankreatinurie innersekretorischer Störungen durch Hormone des Hyperphysenvorder- und Hinterlappens, der Schilddrüse und der Nebenniere. *Ztschr. f. d. ges. exper. Med.*, 1935, 95, 206-213.
- (34) Sedgwick, J. P. Creatinine and creatine metabolism in children. *J. Am. Med. Assoc.*, 1910, 55, 1178-1180.
- (35) Shock, N. W. Standard values for basal oxygen consumption in adolescents. *Am. J. Dis. Child.*, 1942, 64, 19-32.
- (36) Shock, N. W. The effect of menarche on basal physiological functions in girls. *Am. J. Physiol.*, 1943, 139, 288-292.
- (37) Shock, N. W. Basal blood pressure and pulse rate in adolescents. *Am. J. Dis. Child.*, 1944, 68, 16-22.
- (38) Talbot, F. B., and Gamble, J. L. The protein metabolism of an infant. *Am. J. Dis. Child.*, 1916, 12, 333-344.
- (39) Taylor, A. E. On creatinuria. *J. Biol. Chem.*, 1915, 21, 663-665.
- (40) Taylor, F. H. L., and Chew, W. B. Creatinuria in adult males. *Am. J. M. Sc.*, 1936, 191, 256-263.
- (41) Tierney, N. A., and Peters, J. P. The mode of excretion of creatine and creatine metabolism in thyroid disease. *J. Clin. Investigation*, 1943, 22, 595-602.
- (42) Wang, C. C., Frank, M., Kern, R., and Hays, B. B. Metabolism of undernourished children. III. Urinary nitrogen with special reference to creatinine. *Am. J. Dis. Child.*, 1926, 32, 360-366.
- (43) Wang, C. C., Genther, I., and Hogden, M. S. Metabolism of adolescent girls. III. The excretion of creatinine and

#### CHILD DEVELOPMENT

creatine. Am. J. Dis. Child., 1936, 51, 1268-1276.

(44) Wilkins, L., and Fleischmann, W. Hypothyroidism in childhood. IV. The creatine and cholesterol response to thyreotrophic hormone. J. Clin. Endocrinol., 1941, 1, 98-108.

(45) Wolff, W. Zur Bewertung der exogenen Kreatinurie nach intravenöser Kreatinbelastung. Ztschr. f. klin. Med., 1933, 124, 370-378.

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